EXHIBIT V

12

Qualitative Data, Analysis, and Design

OUTLINE

OVERVIEW

Recall from the two previous chapters that researchers seek the guidance of a *research design*, a blueprint for collecting data to answer their questions. Those chapters described experimental and non-intervention designs, often incorporating statistical analysis, that are commonly used in educational research. This chapter continues a sampling of research designs with a

focus on common qualitative research. The orientation of qualitative researchers contrasts sharply with that of quantitative researchers on many dimensions. Their thinking generates questions that are answered with an emergent methodology, and their approach to rich sources of data requires creativity for its analysis. Such divergent ("outside the box") thinking is apparent in the tasks of designing and analyzing qualitative research. This will become clear in this chapter when we focus on how researchers analyze qualitative studies to extract the most meaning while ruling out alternative explanations.

"Emergent" designs in the tradition of qualitative research suggest a process that is not predetermined. A design that emerges is one that is not finalized at the outset. Strategies for data collection are open and depend on context. Revisions are made until the researcher is satisfied that the direction taken affords the greatest potential for discovery, meaningful answers to questions posed, or the generation of new hypotheses (or questions). Of course, qualitative researchers begin with an interest or guiding question, but early decisions about what type of data should be collected and how it should be collected will undoubtedly be revised as the research progresses. A qualitative research design evolves and is likely not clarified until data collection ends. What may start as a case study may indeed develop into a design that more closely resembles a phenomenological study (described later). For this reason, this chapter is organized somewhat differently. Qualitative research designs are described *after* types of qualitative data and methods of analysis are described. The type of data collected and the approach to its analysis are more relevant to a researcher's compelling argument and sound conclusion than a category name placed on a general approach to data collection.

After describing qualitative data and strategies for analysis, this chapter examines five broad classifications of designs: case study, phenomenological, ethnographic, narrative, and mixed methods. These designs require complex collection of data as sources of evidence for claims about the meaning of the data. Qualitative researchers become skilled at coding and pattern seeking using analytic induction. Making sense of data in the form of graphics, video, audio, and text requires clear thinking that is aided by theory, models, constructs, and perhaps metaphor. Because qualitative data analysis is less prescribed than statistical analysis and one goal is the discovery of new ideas and their associations, many would argue that it presents a greater challenge. Fortunately, techniques, strategies, and procedures have been developed to help qualitative researchers extract meaning from their data (including software) and interpret it in ways that enhance our understanding of complex phenomena.

QUALITATIVE INQUIRY AND BASIC PRINCIPLES

While there is general consensus about classification systems among researchers who use *quantitative* research designs—how they are distinguished and what to call them—there is less consensus among qualitative researchers about designs. The same can be said for quantitative and qualitative worldviews. One leader in the field of qualitative research in education, Sharan Merriam, notes that "there is almost no consistency across writers in how [the philosophical] aspect of qualitative research is discussed" (2009, p. 8). She also adds that, in true qualitative fashion, each writer makes sense of the field in a personal, socially constructed way. The field of qualitative research is indeed fragmented with confusing language in regard to its orientation and methodological principles of data collection and analysis. Because there is little consensus

about the classification of qualitative research, Merriam (2009) uses a term that guides the following general discussion: *basic qualitative research.* This chapter discusses the basic "qualities" of qualitative research, followed by a description of common designs defined by these qualities. Despite the lack of consensus on types of qualitative research, I believe all qualitative research shares certain characteristics regarding making sense of data. Therefore, the chapter begins by examining how qualitative researchers approach their data.

Qualitative Data

Most qualitative researchers would agree with Snider's (2010) observation that numbers impress, but unfortunately, also conceal far more than they reveal. They would also agree with Davis's (2007) observation that "good qualitative research has equaled, if not exceeded, quantitative research in status, relevance, and methodological rigor" (p. 574). Several principles guide the thinking and planning stages of most qualitative researchers. Qualitative research, in all of its complex designs and methods of data analysis, is guided by the philosophical assumptions of qualitative inquiry: To understand a complex phenomenon, you must consider the multiple "realities" experienced by the participants themselves—the "insider" perspectives. Natural environments are favored for discovering how participants construct their own meaning of events or situations. The search for an objective reality, favored by quantitative researchers, is abandoned to the assumption that people construct their own personalized worlds. For example, the experiences of high school dropouts, how beginning readers think about their comprehension, how an at-risk school transformed into a high-achieving school, what motivated first-generation women college graduates in Appalachia, how creativity is fostered in schools—these are all topics suited for qualitative inquiry. Questions like these yield complex data, although the sources and formats vary.

The most common sources of qualitative data include *interviews*, *observations*, and *documents* (Patton, 2002), none of which can be "crunched" easily by statistical software. The description of people's lived experiences, events, or situations is often described as "thick" (Denzin, 1989), meaning attention is given to rich detail, meaningful social and historical contexts and experiences, and the significance of emotional content in an attempt to open up the word of whoever or whatever is being studied. The goal of qualitative data analysis is to uncover emerging themes, patterns, concepts, insights, and understandings (Patton, 2002). Qualitative studies often use an analytic framework—a network of linked concepts and classifications—to understand an underlying process; that is, a sequence of events or constructs and how they relate. Here is one example (an abstract provided by Moorefield-Lang [2010]) of a study that uses common sources of data to answer ("explore") a research question under the qualitative paradigm:

> This study explores the question "Does arts education have a relationship to eighth-grade rural middle school students' motivation and self-efficacy?" Student questionnaires, focus-group interviews, and follow-up interviews were data collection methods used with 92 eighth-grade middle school students. Strong emphasis was placed on gathering personal narratives, comments, and opinions directly from the students. Content analysis was used to analyze the student interviews. (p. 1)

Worldview

A perspective that favors the social construction of reality described above is usually referred to in education as *constructivism*, falling clearly under the philosophical orientation called *interpretivism.* This orientation honors the understanding of a whole phenomenon via the perspective of those who actually live it and make sense of it (construct its meaning and interpret it personally).

A clear alternative, and sharply contrasted, paradigm to interpretivism is *positivism*, closely aligned with objective measures and quantitative research designs. Quantitative researchers, in contrast to qualitative researchers, are comfortable with an orientation toward understanding the objective world via experimental designs that test hypotheses born from theories and result in statistical generalizations that apply to a population at large. The researcher in this case often administers standardized measuring instruments in controlled settings, such as tests of cognitive skill, achievement, and attitudes, and analyzes data using statistical software. The general understanding favored by quantitative, positivist researchers comes from empirical verification of observations, not subjective experiences or internal states (emotions, thoughts, etc.) of research participants.

In contrast, the qualitative researcher often *is* the instrument, relying on his or her skills to receive information in natural contexts and uncover its meaning by descriptive, exploratory, or explanatory procedures. Qualitative researchers value case studies (or multiple-case studies), for example, whereas quantitative researchers tend to value large sample sizes, manipulation of treatments and conditions, and true experiments or quasi-experiments.

Both approaches to research in education have yielded valuable, influential knowledge, and it is clear that debate will continue over which approach is more useful in education. Compelling arguments are offered by advocates of both orientations. Given that many qualitative researchers favor case studies of a single "unit" (person, school, etc.), the oft-cited criticism of qualitative research is lack of generalization. Pioneer qualitative researchers Lincoln and Guba (1985) remind us that "the trouble with generalizations is that they don't apply to particulars" (p. 110). The quantitative researcher might critically evaluate the qualitative researcher by noting, "What? Your conclusion is based on only one participant?" And the other would respond, "What? Your conclusion is based on only one experiment?" Suffice it to say that understanding educational effects and processes may arise from many different approaches to research, including the mixing of both qualitative and quantitative approaches. There is no need to identify strictly with one orientation or the other.

The division in beliefs about knowledge described above has created very different research paradigms, splitting many researchers into quantitative (positivist) and qualitative (interpretivist) "camps." Both, however, value rigorous data collection and analysis coupled with sound, logical arguments that characterize scientific reasoning, namely a compelling chain of evidence that supports conclusions. Both camps are keenly aware of rival hypotheses and alternative explanations for their findings, and both attempt to eliminate the plausibility of counterhypotheses and their propositions. Further, interpretivist models of qualitative research, such as original grounded theory (Glaser & Strauss, 1967), whereby emerging themes are discovered and modeled into theory, have evolved into more objective, positivistic approaches to describing the external world, such as that advocated by Charmaz (2000).

General Approaches

The type of understanding sought by qualitative interpretivists demands great flexibility in the data analysis process, as it does in the design and data collection phase. Qualitative research methods are not "routinized," meaning there are many different ways to think about qualitative research and the creative approaches that can be used. Good qualitative research contributes to science via a logical chain of reasoning, multiple sources of converging evidence to support an explanation, and ruling out rival hypotheses with convincing arguments and solid data. Sampling of research participants in qualitative research is described as *purposive*, meaning there is far less emphasis on generalizing from sample to population and greater attention to a sample "purposely" selected for its potential to yield insight from its illuminative and rich information sources (Patton, 2002, p. 40).

Most mindful qualitative research questions are "How" or "What" questions (e.g., "How did this happen?" "What is going on here?") and geared toward complex processes, exploration, and discovery. The analysis itself, naturally, becomes complex. Schram (2006) describes qualitative research as "contested work in progress" (p. 15) and the qualitative predisposition as "embracing complexity, uncovering and challenging taken-for-granted assumptions" (p. 7) and being "comfortable with uncertainty" (p. 6). The aim of qualitative research is closer to problem generation ("problematizing") than problem solution (Schram, 2006).

Qualitative data collection and analysis usually proceed simultaneously; ongoing findings affect what types of data are collected and how they are collected. Making notes, referred to as *memos*, as the data collection and analysis proceed is one important data analysis strategy. The notes, or possibly sketches, trace the thinking of the researcher and help guide a final conceptualization that answers research questions (or related ones) and offers a theory as an explanation for the answers. These memos support all activities of qualitative data analysis as suggested by Miles and Huberman (1994): data reduction (extracting the essence), data display (organizing for meaning), and drawing conclusions (explaining the findings). They noted, "Fieldwork is so fascinating, and coding usually so energy absorbing, that you can get overwhelmed with the flood of particulars—the poignant remark, the appealing personality of the key informant, the telling picture on the hallway bulletin board, the gossip after a key meeting" (p. 72).

As noted previously, the entire process of making sense of qualitative data requires creativity. Patterns and themes among complex data don't usually pop out. The challenge is lessened by following suggestions provided by Patton (2002, p. 514), including being open to multiple possibilities or ways to think about a problem, engaging in "mental excursions" using multiple stimuli, "side-tracking" or "zigzagging," changing patterns of thinking, making linkages between the "seemingly unconnected," and "playing at it," all with the intention of "opening the world to us in some way" (p. 544).

The validity of qualitative research is often referred to as trustworthiness or credibility. Common methods of assessing validity include *consistency checks*. Independent coders can sample raw data and create codes or categories so that the consistency of data reduction methods can be assessed. Also common is the use of *stakeholder checks.* The research participants who generated the raw data, often called informants, may be asked to evaluate the interpretations and explanation pulled from the data (e.g., "Does this represent your experience?" "Have I captured the essence of this event?"). Other stakeholders, especially those affected by the research, may also provide commentary on the results.

Qualitative researchers become skilled at coding using procedures as simple as handwritten note cards or a copy/paste function in Microsoft Word or a similar program as an aid to discovering recurring patterns. They may also use an array of software designed specifically for the purpose of reducing data into manageable, but meaningful, chunks. They are also skilled at forming categories, linking categories using a meaningful system or network, creating themes, and interpreting derived frameworks with reference to theory. Visual models play an important part in describing the meaning of the data and conveying an understanding to others. The model may portray a hierarchy or perhaps a causal chain. Process (sequence of events) models are common, as are models related to the arts and humanities (e.g., portraiture or plays). Models must accurately reflect the data, of course, but their creation is only limited by the imagination of the researcher.

Qualitative data analysis often follows a general inductive approach (as opposed to a hypothetical-deductive one) in the sense that explicit theories are not *imposed* on the data in a test of a specific hypothesis. Rather, the data are allowed to "speak for themselves" by the *emergence* of conceptual categories and descriptive themes. These themes are usually embedded

in a framework of interconnected ideas that "make sense." The conceptual framework is then interpreted by the researcher with reference to the literature on a topic in an attempt to explain, with a theory (or a revision of one), the phenomenon being studied. Many different interpretations are typically considered before the researcher builds a coherent argument in the most transparent way possible (revealing how the conclusion was reached) so that others may judge the validity of the study. This is not to say that qualitative researchers never use deductive reasoning. On the contrary, if a very specific hypothesis can be deduced from a more general theory, qualitative researchers may explore this hypothesis using common data collection methods (interview, observation, retrieval of documents) to determine whether the predicted outcomes are evident. Yin (2009), in fact, recommends that theoretical propositions be in place *prior* to data collection and analysis in most case studies.

Fundamental differences between quantitative and qualitative research are summarized in Table 12.1. It becomes clear that these different orientations lead to very different strategies for answering research questions.

Table 12.1   Key Differences Between Quantitative and Qualitative Approaches to Inquiry That Guide Data Collection and Analysis

Quantitative Research	Qualitative Research
Tests hypotheses born from theory	Generates understanding from patterns
Generalizes from a sample to the population	Applies ideas across contexts
Focuses on control to establish cause or permit prediction	Focuses on interpreting and understanding a social construction of meaning in a natural setting
Attends to precise measurements and objective data collection	Attends to accurate description of process via words, texts, etc., and observations
Favors parsimony and seeks a single truth	Appreciates complexity and multiple realities
Conducts analysis that yields a significance level	Conducts analysis that seeks insight and metaphor
Faces statistical complexity	Faces conceptual complexity
Conducts analysis after data collection	Conducts analysis along with data collection
Favors the laboratory	Favors fieldwork
Uses instruments with psychometric properties	Relies on researchers who have become skilled at observing, recording, and coding (researcher as instrument)
Generates a report that follows a standardized format	Generates a report of findings that includes expressive language and a personal voice
Uses designs that are fixed prior to data collection	Allows designs to emerge during study
Often measures a single-criterion outcome (albeit multidimensional)	Offers multiple sources of evidence (triangulation)
Often uses large sample sizes determined by power analysis or acceptable margins of error	Often studies single cases or small groups that build arguments for the study's confirmability
Uses statistical scales as data	Uses text as data

(Continued)

Table 12.1 (Continued)

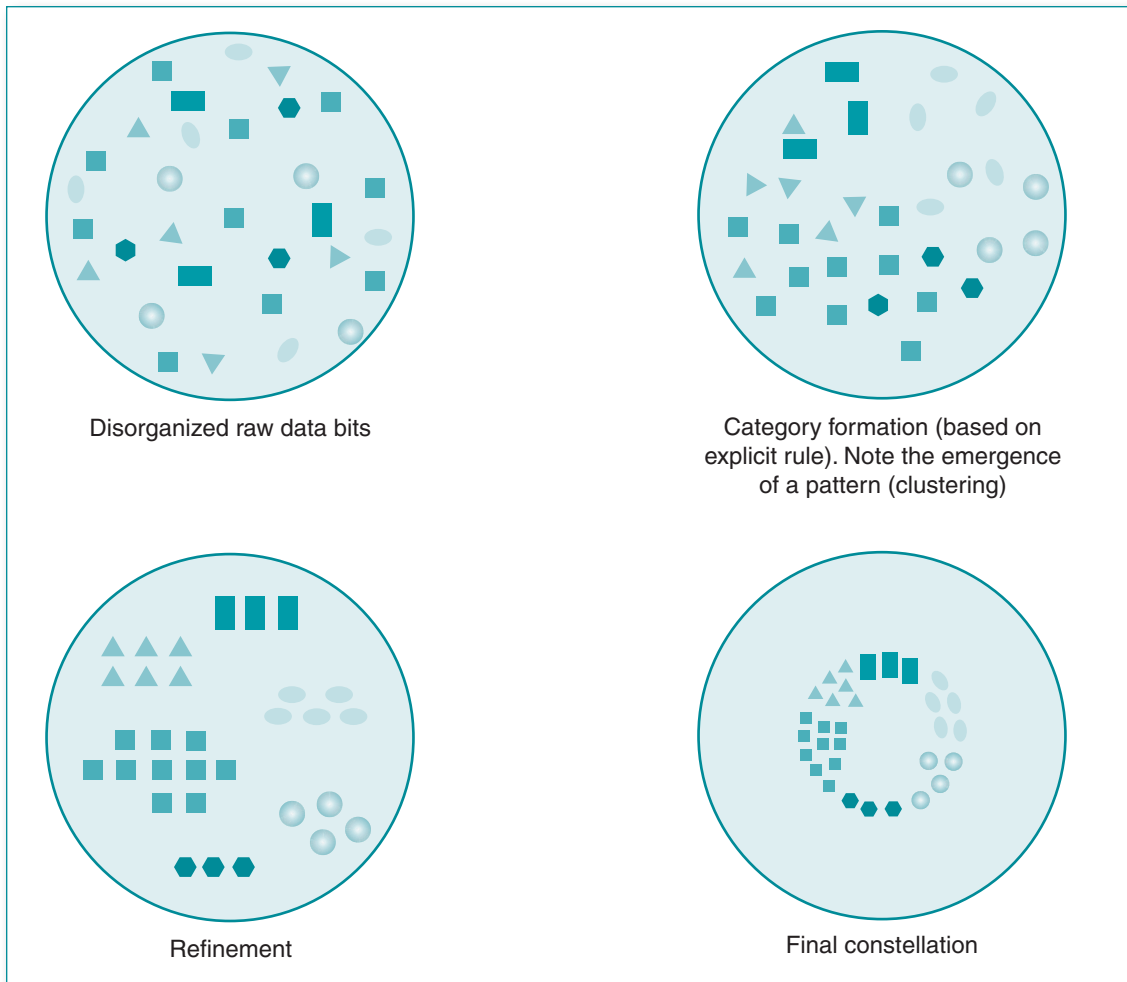| Quantitative Research	Qualitative Research
Favors standardized tests and instruments that measure constructs	Favors interviews, observations, and documents
Performs data analysis in a prescribed, standardized, linear fashion	Performs data analysis in a creative, iterative, nonlinear, holistic fashion
Uses reliable and valid data	Uses trustworthy, credible, coherent data

The Qualitative Metaphor

Generally, qualitative data analysts face the task of recording data via a variety of methods (interviews, observation, field notes, etc.), coding and categorizing (using a variety of clustering and classification schemes), attaching concepts to the categories, linking and combining (integrating) abstract concepts, creating theory from emerging themes, and writing an understanding. Metaphors are useful as interpretive tools in this process, serving a heuristic (guiding) role or explaining the elements of a theory.

One useful metaphor is a kaleidoscope (Dye, Schatz, Rosenberg, & Coleman, 2000) for the purpose of describing qualitative data analysis. They refer to grouping similar data bits together, then comparing bits within a pile. Differentiation creates subpiles, which eventually become connected by a pattern they share. This process requires continual "back and forth" refinement until a grand concept emerges. For Dye and colleagues, the loose pieces of colored glass represent raw data bits, the angled mirrors represent categories, and the flat plates represent the overarching category. An adaptation of this metaphor appears in Figure 12.1.

Another metaphor is a jigsaw puzzle (LeCompte, 2000). Assembling data into an explanation is akin to reassembling puzzle pieces. One strategy is grouping all pieces that look alike, sky for example, and placing these pieces near the top. Other sketchy-looking objects may be grouped together using any dimension (e.g., color) whose properties make conceptual sense. Puzzle pieces will have to be rearranged many times before the reassembled pieces emerge into a coherent pattern. If successful, a whole structure will eventually be built, held tight by the interconnected pieces. The structure is the model or theory that explains the phenomenon of interest. If a qualitative researcher is studying the high school dropout phenomenon, for example, the structure that surfaces might be a model of alienation, one derived from the puzzle pieces that link to achievement, socioeconomic status, home environment, self-esteem, social status, and bullying. The puzzle pieces might include sources of data such as conversations, observations, school documents and records, and journals, to name a few. Good qualitative analysis in this case would generate a rich and accurate description of alienation as experienced by high school dropouts—their world, why they hold a specific view, and how it came to be.

Yet another metaphor was introduced by Seidel (1998): Qualitative data analysis is best understand as a symphony based on three elegant but simple notes—noticing, collecting, and thinking. Clearly not linear, the process is described as iterative (a repeating cycle), recursive (returning to a previous point), and "holographic" (each "note" contains a whole) with "swirls and eddies." When one notices, one records information and codes it using an organizing framework. When one collects, one shifts and sorts information.

Figure 12.1   A kaleidoscope metaphor describing one approach to analyzing qualitative data.

Disorganized raw data bits

Category formation (based on explicit rule). Note the emergence of a pattern (clustering)

Refinement

Final constellation

When one thinks, one finds patterns, makes sense of them, and makes discoveries (including "wholes" and "holes"). Seidel also explains these three notes using a threaded DNA analogy as well as a topographic map and landscaping analogy (including using your right brain for off-road investigation). As you might expect, this process is made far easier by software developed by John Seidel and others (Ethnograph) that manages your "notes" as you collect data, code data, write memos about your thinking, and complete your analysis and writing.

Whatever the metaphor, data analysts are frequently "in conversation" with their data (Shank, 2006). Potentially useful conversations may begin with questions such as "What are you telling me?" "Are you hiding anything?" "Is there anything you want to say?" "How do you explain that contradiction?" or "Will others believe what you say?" These questions reveal that qualitative analysis requires becoming immersed in data. There are no superficial or rigid prescriptions for making sense of it all.

TEXT AS DATA: BASIC STRATEGIES

Much qualitative data exists in the form of narrative (text) scripts, commonly gathered from interviews, survey questions, journals, recorded observations, or existing documents, among other sources. Words combine into meanings, but meanings must be sorted, interpretations considered, and conclusions reached. One begins with a sharp but flexible focus, recognizing that refocusing may be required to extract the greatest meaning and most trustworthy conclusions from the data. For example, I may focus on the literal meaning of a person's story, only to find a pattern in deeper meanings, details not mentioned, an emphasis on time, avoidance of emotional content, or any number of other subtle clues that help identify a coherent theme, and realize that I should be focusing on the hidden meanings of the story.

As noted previously, the sampling plan for gathering text is often purposive, meaning that participants are selected to serve a specific purpose (not randomly to allow generalization across a population). The purpose of this sampling plan is to maximize the value of data for theory development by gathering data rich enough to uncover conceptual relationships. Each sampling unit (person, classroom, school, etc.) may be distinctive by deliberate selection (e.g., two students who rose to the challenge; one succeeding, one not succeeding; and one who didn't try). Or they may be selected because they share a common characteristic (e.g., first-year teachers); perhaps one participant's data will help develop a theory, the second will refine it, and the third will evaluate it. Perhaps only one school is selected because it defies prediction (e.g., school characteristics suggest poor achievement, yet it consistently ranks high on all achievement measures—why?). Simply, the sample selected depends on its purpose.

Qualitative analysis of text is often supplemented with other sources of information to satisfy the principle of **triangulation** and increase trust in the validity of the study's conclusions. It would not be uncommon, for example, to analyze transcribed interviews along with observational field notes and documents authored by the respondents themselves. The purpose of multiple sources of data is corroboration and converging evidence.

Qualitative researchers often keep journals that describe their approaches to data analysis. Being able to retrace your thinking may contribute to the emergence of new ideas, an interpretive path not yet taken, or possibly connections between an early (discarded) idea and a newer developing theme that explains previously noted inconsistencies. A recording of ideas and decisions also enables another person to evaluate the conclusions reached based on its logical consistency. Retracing your thinking is important; for example, describing the reasons you began with preestablished categories for initial coding is useful for building an argument to explain why your conclusion is based on categories that emerged only after older theories or models did not fit the data. This is why qualitative researchers rely on memos, or written ideas, as they occur to help sort data into categories, define their properties, and make sense of them by discovering the relationships among categories.

Qualitative data analysis eventually reaches a point called **saturation**, often signaling completion of the study when there is a judgment of *diminishing returns* and little need for more sampling. This is the point where new data and their sorting only confirm the categories (often numbering between three and six or so), themes, and conclusions already reached. Perhaps data analysis yields a conclusion that is best described by reference to a metaphor (e.g., teachers as orchestra leaders, contractors, or mediators). This conclusion will be strengthened by a description of how and why saturation was reached. For example, journal recordings

■ **Triangulation:** A method used in qualitative research that involves cross-checking multiple data sources and collection procedures to evaluate the extent to which all evidence converges.

■ **Saturation:** In qualitative research, the point in continuous data collection that signals little need to continue because additional data will serve only to confirm an emerging understanding.

of the reasoning behind major decisions over time and evidence that supports both the saturation and the concluding argument build a solid case for your conclusion.

Conclusions in qualitative research are typically derived from identified patterns and uncovered conceptual, not statistical, relationships. The discovery of connections in the data may support a theory, revise one, or generate a new one. As described earlier, this type of analysis is inductive, with thinking moving in the direction of specific observations to a more general theory or explanation (often referred to as "bottom-up"). The exploration of data is flexible in the sense that the researcher is open to new constructs (ideas) and explanations (theories), given that existing variables are often unknown. Entirely new questions may evolve from the analysis, potentially answerable from the same data sources. The task is often described as *iterative*, meaning there is repeated movement back and forth between raw data (narrative text), codes, categories, and plausible explanations that emerge. The process ends with a reasonable conclusion. The task is also "interpretive" because it requires "sense making" as meanings emerge. Ultimately, the qualitative data analyst aims to create a shared understanding that forms a coherent structure, a unified whole. Each level of analysis, from codes to categories to themes, reaches higher levels of abstraction.

Qualitative researchers often seek relationships between conceptual ideas generated from the narrative data. For example, presume that teachers' interviews about stress are transcribed and their major ideas coded (e.g., emergence of "compassion fatigue," "resource issues," and "creative illness," among others). Later in the interviews, teachers refer to an idea coded as "protective barriers." Across several interviews, a pattern emerges: References to compassion fatigue co-occur with mention of codes ultimately categorized as "protective barriers," a major category with several subcategories (home remedies, seeking mentorship, reducing home visits, use of humor, etc.). Further analysis may reveal that protective barriers are associated with less commitment to the profession (another category). From this analysis, a theory of teacher attrition may emerge, one that posits the central role of compassion fatigue as opposed to more tangible influences such as low pay or lack of resources.

Connections between ideas that form a whole often reveal themselves via visual aids such as matrices, tables, concept maps, charts, boxes, and cross tabulations (categories of a critical dimension suggested by theory). The power of visual tools to reach less-than-obvious conclusions is illustrated by Wainer (2000) in *Visual Revelations.* Bullet-ridden planes returning to aircraft carriers during World War II were mapped by the location of their holes so that the manufacturer could strengthen the armor plates where there were the *fewest* holes, the reasoning being that planes damaged in those areas were likely not airworthy (they did not return). Often these visual displays highlight contrary evidence—instances that do not fit your proposed category structure. Data that "jump out" in contradiction may lead to a revision of the scheme initially imposed on the data. Sometimes counterevidence or perplexing gaps lead to new research questions. Qualitative researchers always consider alternative explanations as they "reenter" the data and wrestle with it to locate supporting or refuting evidence. Further, there is often a need to access additional sources of data for evaluation of a particular interpretation. Finally, qualitative researchers guard against "confirmation bias," or seeking out evidence that supports their initial conclusion or personal view while other data are filtered.

Another aspect of qualitative data "wrestling" involves a method of analysis known as *constant comparison*, originally developed by Glaser and Strauss (1967). This process begins with reasonable codes, categories, and themes—an emerging theory—suggested by the first instance of narrative text (or any observation). The next instance is evaluated—or

compared—with reference to the emerging theory. It may or may not fit, and revisions may be necessary. The next instance (source of data) is similarly compared to the tentative theory. The task becomes one of constantly comparing the emerging, but tentative, structure to new information until a scheme for classifying (and understanding) the meaning of data becomes whole and coherent. This is often referred to as a "core" category with defined properties and dimensions integrating all other categories, the top of the conceptual hierarchy. It forms a "storyline," the basis for communicating elements of the generated theory.

This process and its system of coding (including abstract theoretical codes) became known more commonly as grounded theory (Glaser & Strauss, 1967); that is, discovering theory implicit (hidden) in data. Grounded theory approaches to qualitative data continue to have major influence among qualitative researchers. Many studies over the past 40 years have been analyzed using grounded theory (or one of its variants), which remains one of the most commonly used approaches today. (In the same sense that Campbell and Stanley [1963] have had tremendous impact in the field of quantitative design and analysis, it may be said that Glaser and Strauss [1967] have had impact in the field of qualitative design and analysis.)

RECAP: THE QUALITATIVE CHALLENGE

We have seen that the process of qualitative data analysis is concerned with the *qualities* exhibited by data more than with their *quantities*. As such, many researchers believe that qualitative data analysis is a far more challenging, time-consuming, and creative endeavor than quantitative data analysis. Qualitative data analysis is less technical, less prescribed, and less "linear" but more iterative ("back and forth") than quantitative analysis. In fact, qualitative data analysis is often performed *during* data collection with emerging interpretations—a working hypothesis—guided by a theoretical framework. Qualitative data analysis *evolves* throughout the whole research project and is clearly *not* summarized by a single number such as a *p* value, as is the case with quantitative studies.

Interviews often produce hundreds of pages of transcripts, as do detailed field notes from observations. All of this information requires critical examination, careful interpretation, and challenging synthesis. A good qualitative analysis discovers patterns, coherent themes, meaningful categories, and new ideas. In general, good analysis uncovers better understanding of a phenomenon or process. Some qualitative researchers prefer to use the term *understanding of data* instead of *analysis of data.* The analysis of rich descriptions occurring throughout the course of a project often provides new perspectives, and its analysis of interconnecting themes may provide useful insights. The depth afforded by qualitative analysis is believed by many to be the best method for understanding the complexity of educational practice. Qualitative analysis is also well suited for exploration of unanticipated results. Above all else, it is concerned with finding *meaning* embedded within rich sources of information.

Researchers with a qualitative orientation often view their work as a challenging craft that shows in their writing. Good qualitative data analysis often impacts readers through powerful narratives such as stories.

HIGHLIGHT AND LEARNING CHECK 12.1 QUALITATIVE DATA ANALYSIS

Data analysis in qualitative research focuses on qualities more than quantities. The statistical focus on the *p* value in quantitative research is replaced in qualitative research with pattern seeking and the extraction of meaning from rich, complex sources of linguistic (narrative) or visual (image) data. Much effort is directed toward the creation of categories. Words, symbols, metaphors, vignettes, and an entire array of creative linguistic tools or visual displays may be used instead of the "number crunching" employed in qualitative data analysis. Qualitative data analysis is far less "linear" and prescribed than the statistical analysis used so commonly in quantitative research. One common goal is to establish the credibility of qualitative research findings and conclusions. Describe the different skills required for being proficient in each type of data analysis.

For example, Clark and colleagues (1996) began the data analysis section of their qualitative study of teacher researcher collaboration by stating, "Our story comes from the words and voices of the people involved" (p. 203). Clark and colleagues' study presented data in a form they called "Readers Theater," a written script based on dialogues and interactions during meetings of 10 teacher researchers. Miles and Huberman (1994) stated that "words, especially organized into incidents or stories, have a concrete, vivid, meaningful flavor that often proves far more convincing . . . than pages of summarized numbers" (p. 1). A good qualitative analysis often yields stimulating conclusions and sometimes affords a new and useful way to view old problems. Qualitative research is often described as "exploratory" (not confirmatory) because a researcher's goal is to generate a hypothesis (not test one) for further study—a hypothesis that may generalize well beyond the data collected.

CRITICAL THINKER ALERT 12.1   QUALITATIVE DATA ANALYSIS

The types of thinking and skills needed for qualitative data analysis are different from those needed for quantitative data analysis. Creativity, divergent thinking, keen perception of patterns among ambiguity, and strong writing skills are helpful for qualitative data analysis. Qualitative analysis is less dependent on computing software. Whereas statistical analysis often centers on the p value, qualitative data analysis involves more time-consuming extraction of meaning from multiple sources of complex data.

Discussion: In what way is creativity an important skill in the analysis of qualitative data? Does this suggest that the quantitative analysis of data is not creative?

The analytic challenge for the qualitative researcher is to reduce data, identify categories and connections, develop themes, and offer well-reasoned, reflective conclusions. This is a process of tearing apart and rebuilding abstract conceptual linkages, requiring synthesis and creative insight, changing one's "lens" to reconstruct an interpretation, and definitely carefully documenting the process to enhance the credibility of findings.

Qualitative data analysis is not intended to generalize to a larger population in the same sense that a statistically analyzed large-scale survey would. The generalization often sought is the *generalization of ideas* so that they can be applied in many contexts. In this sense, ideas generated by a single-person or single-institution case study may be broadly applicable. A single memorable quote in context, as we know from history, can have a powerful influence.

CODING

Lest the process of qualitative data analysis become too abstract, let's consider a concrete example that illustrates a few basic principles. Presume that 10 teachers are interviewed who share a common quality: They have been classroom teachers for 40 years or more. What can we learn from such seasoned veterans that will help novice teachers? Each experienced teacher is asked five questions during an interview with this question in mind. The box on page 354 includes three teachers' transcribed responses to one question along with a first attempt at coding the responses. (The purpose of this illustration is to convey in a concrete manner how one might proceed with the initial stages of coding.)

A SNIPPET OF RESPONSES TO ONE INTERVIEW QUESTION POSED TO THREE RESEARCH PARTICIPANTS

Researcher question (open ended): I understand all of you have been teaching high school continuously for 40 years or more. What advice do you have for teachers beginning their first year of teaching?

Teacher 1: I was scared the first year or two, almost every day. Not for my safety or anything like that, but I kept thinking I might fail, maybe my students wouldn't learn anything. I was not that much older than my students. Now, of course, I'm more like a grandmother figure to them. I was worried they would not take me seriously—you know, cut up and take advantage of a young, first-year teacher. Maybe my insecurity showed, maybe they saw my lack of confidence or figured I didn't know what I was doing because I was not very experienced. Now, of course, I think how silly to have worried about such things. So, to answer your question, I would say, "Don't worry, be happy."

Code: Overcome insecurity

I know some people say "Forget everything you learned in your teacher prep program [pause], real learning goes on in the trenches." Sure, you learn by doing, but some old ideas in teaching textbooks are time honored and priceless.

Code: Use learning theory

I recall one theory that focused on time, you know, all kids can learn if given enough time. That's so true. If new teachers know that fact, then they won't get frustrated. They will know that learning algebra, for example, will eventually happen with more time, maybe after school, maybe during the summer. New teachers have to know some kids learn really fast; others, really slow. But they do learn. But there is a clock with a buzzer, so I know time runs out. Before time runs out, the teacher should try something new, maybe explaining it with a sketch on paper—yeah, that's it. Try something new.

Code: Experiment with methods

Teacher 2: I remember I marched into my classroom full of vigor and ready to conquer the world. Boy, did those rascals put me in my place! I remember that I thought about quitting my whole first year, crying on the way home sometimes. My dad was a teacher, and he kept saying the first year is hard—just keep going, he would say. That was hard. [Now, what was your question? Laugh.] Oh yeah, I would tell new teachers that it gets better and better every year, like a fine wine! If it didn't, then why would I stay in the classroom for 40 years!

Code: Brace yourself; it only improves

They have to know that the first year is trial and error. Well, not just the first year; you have to experiment all the time to find the right approach with some students.

Code: Experiment with methods

They should know that you won't be teaching the same way year after year. You can't be a repeating robot. People change with the times; every year can be different. What is that motto? Change is good, or something like that. Sometimes you have to be creative.

Code: Be flexible; adapt to change

I used to complain about chalk on my clothes; now I complain about lugging my laptop to school. You never know when the school's computer—I think it's a 1988 Apple IIe or something—will crash on you. I use my computer a lot to update grades, make changes to assignments and all that. My students can go to a website 24/7 and learn what to do for homework. So, I guess my advice is to roll with the punches and don't expect a routine. Routines get boring after a while anyway. Yeah, I would say keep changing with the times and welcome new ways of doing things.

Code: Welcome innovation

Everything changes so fast these days anyway.

Teacher 3: I would say prepare to wear many hats. That is because teaching today is very different than when I first started. I would say something like, you are a part-time teacher, part-time counselor, part-time social worker, part-time therapist, even part-time parent! Teaching in the old days was pretty much teaching; today it is far more and new teachers must be prepared for that.

Code: Brace yourself for multiple roles

I don't think they train new teachers to be social workers, but what else can you do when a student comes in hungry and holds back tears? What did she just experience? What do you do when another student comes in acting high on drugs? You see, teaching becomes harder and harder when you know that some students cannot concentrate on learning.

Code: Be prepared for challenges beyond teaching

Many have huge problems that they deal with. I do what I can, but with so many other students, it's just a hard job. I think they call it compassion fatigue, or something like that. I'm one of the lucky ones; I can go to the mountain cabin for most of the summer. Others, I know, take on other jobs during the summer to pay bills. New teachers should know about the challenges from Day 1, challenges that are not related to lesson plans or technology. The problems are not insurmountable. If they were, I would have started a business or something like that instead. I've loved every class, every semester, because you can make a difference in kids' lives. Students comes back sometimes

after 20 years to say hello, especially when they have their own kids in the school. They tell me I made a difference, so I would tell new teachers that they make a difference, though they don't know it yet.

It may take years to find out when a student comes back to say I influenced them in positive ways. It's a great job.

Code: Making a difference

Memo to Self: *What have I learned so far? Consider category Adapt to Change or Welcome Innovation. Adapt has emerging subcategories. Possible Core? Consider Be Prepared as a category*

with subcategories (multiple roles, others?). Another idea: Inquire about creativity—how they foster it among students and themselves. Might an all encompassing category be related to creativity? Ask a "creativity" question on the next round of questions.

Note that one teacher mentioned creativity. Perhaps they have noticed a decline in creativity in their students over the years. Some good evidence exists that creativity is declining in America. Do these teachers encourage creativity, I wonder? Be open to a creativity theme or even a theory that creativity sustains these teachers. Perhaps they can report on the creative accomplishments of their prior students (more than average?). A creativity theory could be very exciting.

Different respondents to the same question, naturally, will respond differently by using words or phrases that don't match yet are still conceptually related. The open codes, created by the first pass through the data that focuses on identifying, labeling, and classifying, may be combined into one overarching concept. For example, "Experiment with methods" and "Welcome innovation" (and future codes such as "Forward thinking" or "Being flexible" or "Keep trying new approaches") are open codes that may be combined into the single concept "flexible/inventive" at first, then possibly "creative/experimental." Finally, the best fit appears to be simply "innovative," with clear properties that define it (e.g., creativity). As is true with other levels of coding, a critical procedure is the back-and-forth comparison within categories and their properties, between categories (to make tentative connections), and between other components of conceptualization. Whether in the field making observations or conducting interviews, qualitative data analysts use many different types of coding categories, including those connected to context, situation, ways of thinking, perspectives, processes, activities, events, strategies, and relationships, among others (Bogdan & Biklen, 2003).

The next level of abstraction involves axial coding (Corbin & Strauss, 2007), the grouping of open codes so that their categories (and properties) relate to each other in some analytical way. The guiding question in this step is, "How might these categories be related?" Might they reflect a causal chain? Do they interact? Are they instances of a broader context? These categories and their interdependence essentially become *tentative answers to your research questions.*

The next higher level of abstraction is selective coding, the most theoretical. The task here is interpreting all other categories and classification schemes as representations of a single category—one that relates all others—so that you have draped the conceptual structure. You have answered the question "What is happening here?" by offering a *central or core category* that explains the patterns you have unearthed. The data have been cracked open and placed within a theoretical model. The core category functions as the emerging theory.

RELATIONAL STRATEGIES

Qualitative data are often organized into reduced but meaningful chunks (categories), usually by a system a coding, and interpreted by reference to relationships that emerge from data reduction. The following section describes several tools that have enabled qualitative researchers to think about their data in ways that permit reasonable interpretation. Perhaps the most useful

strategy for qualitative researchers is to *ask questions* and then seek answers in the data. This questioning and (tentative) answering yields a framework for making sense of data (i.e., deciding what to do with categories once they are revealed).

Hierarchy

The hierarchy is one strategy designed to describe data and seek relationships. This is accomplished by a system of superordinate and subordinate concepts that fall in nested ranks. For example, presume that a researcher interviewed 30 parents to learn more about their attitudes toward schooling. Coding, category formation, and classification quickly revealed that some parents placed highest priority on education while others substituted different priorities. One hypothetical hierarchy describing presumed relationships appears in Table 12.2.

Table 12.2   Parents' Attitudes Toward Education Displayed as a Hierarchy

Higher Priority			Lower Priority		
Economic	Tradition	Self-Efficacy	Economic	Tradition	Self-Efficacy
Escape|Thrive	Continuity|Values	Ability|Personality	Futility|Survive	Expectation|Information	Barriers|Helplessness

This hierarchy reveals that both groups of parents cite similar attitudinal dimensions related to economic, tradition, and self-efficacy issues. They are, however, differentiated on specific reasons (third subordinate level) that help us understand their values and dispositions. For example, higher priority on schooling for economic reasons suggests that education functions as an "escape route," increasing the chances of surviving the next generation. For parents who consider education a lower priority, economic factors are related to, for example, helping in the family business where education is simply not needed, hence not valued. The most interesting relationship might be the divergence of ideas about self-efficacy, clearly differentiating the groups. These ideas range from natural ability and a "can-do" attitude to learned helplessness stemming from a history of barriers (real or perceived). In this case, the researcher can conclude there is a relationship between level of priority and the elements (values, information, etc.) of similar superordinate constructs (e.g., tradition). The clear attitude differences between the two groups have implications for efforts toward restructuring cognitive beliefs so that parents understand that all children can learn despite the challenges imposed by the realities of lower socioeconomic status.

The above hierarchy is hypothetical and represents only one of many diagrams that display uncovered relationships. Others include Venn diagrams (overlapping circles) to show connections between elements or variables and radial diagrams (center circle with a ring of outer circles) to show connections to a core (the overarching principle).

Typology

Systems of classifications are often referred to as typologies (or taxonomies), such as those used by car makers—SUV, luxury sedan, compact, and so forth. The idea here is to create an arrangement from data reduction that helps us understand complex events, processes, or constructs. Common examples include Bloom's taxonomy of types of thinking (e.g., evaluation,

synthesis, comprehension), Gardner's types of intelligence (e.g., social, emotional), and personality types (e.g., the Big Five, including extraversion, openness, etc.). These typologies have spawned much research.

A hypothetical example of a taxonomy of online learning styles is shown in Figure 12.2 and reveals major dimensions of presentation (e.g., Text), assessment (e.g., Passive), and type of learning activity (e.g., Independent). Such a taxonomy might arise from the data reduction of 200 survey responses regarding students' experiences and outcomes with online learning courses. It could also arise from interviews of 50 ninth graders about their preferences for the delivery of online instruction. For this example, presume the interviews included snippets of a variety of online instructional approaches to illustrate how the same material could be presented in a variety of ways. How each corner is labeled suggests a relationship among preferred styles. For example, that Independent and Social are directly opposite suggests a negative relationship on outcomes that compare independent learning tasks with social ones. Further, elements of each dimension that are closer together (e.g., Active and Social) suggest stronger relationship than those that are farther apart (e.g., Social and Passive). A collaborative (social) project, therefore, might work better than an independent project. The point is that such taxonomies and other heuristic diagrams offer more than a simple list. Patterns and relationships are apparent in the taxonomy itself. This model and its implied relationships suggest the necessity of further research, including determining how reliably online preferences can be measured and whether preferences coincide with performance outcomes, before a formal theory of online learning can be developed.

The same relationship could also be shown as a matrix, as revealed in Table 12.3. Note the negative signs on the diagonal suggesting a negative connection between elements.

Figure 12.2   A hypothetical example of different styles of online learning.
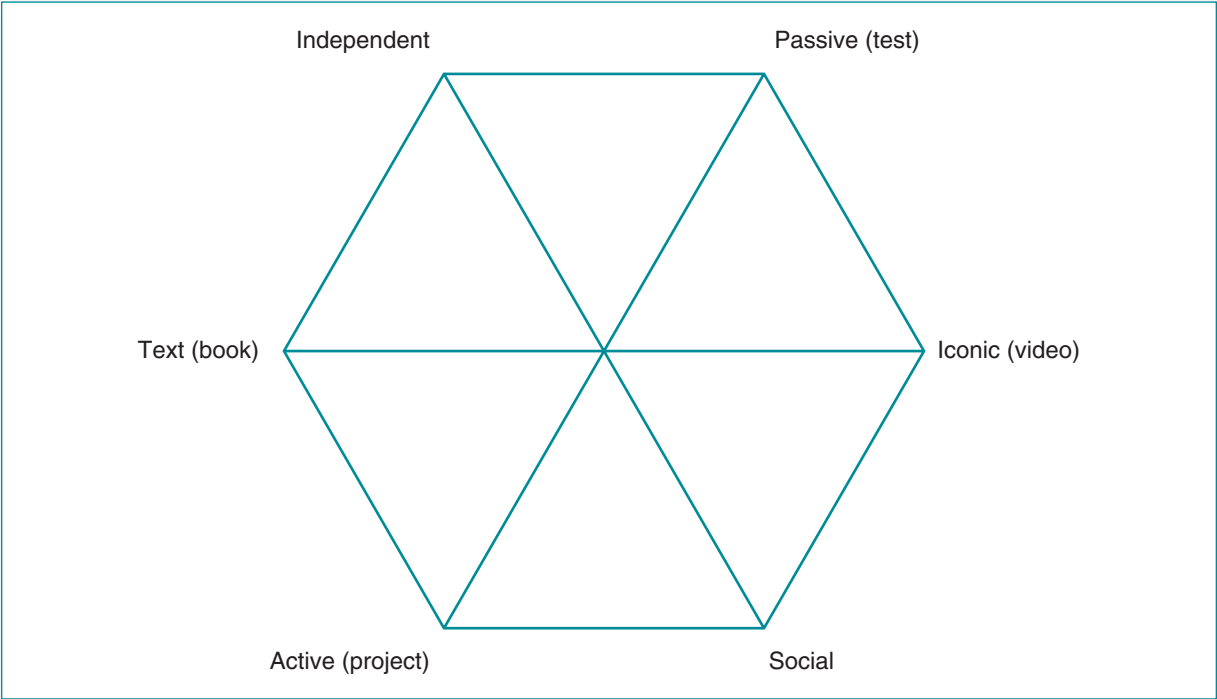
Table 12.3   Hypothetical Example of a Matrix Revealing How Online Learning Might Be Conceptualized

	Social	Iconic	Active
Independent	–	Multimedia	Project
Text	Read/Discuss	–	Term Paper
Passive	Virtual Lecture	Video	–

Networks

Qualitative researchers may use organizational systems called networks that reveal connections with a process that occurs over time. Let's presume that a qualitative researcher was interested in studying the phenomenon of high school dropout, presumed to be a process that occurs over time. There are many sources of data that might be collected, including student background and psychological characteristics, such as socioeconomic status and attitudes that reflect perseverance (assessed via interviews); academic records and student reactions to them; student behaviors, such as responses to and from other students; trends in academic performance, absenteeism, and other tendencies gathered from records and observations; and school factors (climate, support structure, etc.). These complex data can be reduced in ways that convey a meaningful depiction of the process, suggesting relationships, potential direct (or indirect) causal chains, and pieces of the puzzle that may be missing. One hypothetical network is presented in Figure 12.3, revealing an attempt to make sense of the array of qualitative data collected in this example. It is important to note that a network such as this is not an "armchair" activity divorced from wrestling with the data. In qualitative data analysis, ideas emerge and are tested against other data or new data of the same kind (constant comparison). Eventually, a picture emerges from all sources of data that appears to capture a meaningful representation. In this example, each term suggests a potent variable linked to an outcome. School data and student interviews, for example, may reveal the importance of support for the faltering student. The data may reveal that perception of ineffective support ("Can't relate to the counselor") leads to the same outcome as having limited support ("Counselor is never there"). Other features, such as the implied

Figure 12.3   A hypothetical example of a network that reveals linkages in the process of dropout.

Student Characteristics   **School Support**

Efficacy ↘

History ↘   Low ↘

Resources → **Academic Performance** → prior → current ⇔ **Absenteeism** →   Dropout

Family ↗   Ineffective ↗

Culture ↗

interaction (two-way arrow), suggest compounding influences (performance and atten-dance affect each other). The background variables listed suggest their contribution to our understanding of dropout, and those not listed are missing for a reason. For instance, age is not listed, suggesting little connection between overage and underage high school stu-dents' tendency to drop out.

Tables and Cross Tabulations

Another method for exploring relationships among qualitative data is tabling the occurrences of categories and examining their connections (cross tabulations). In a hypothetical study of academic dishonesty, for example, 100 college freshman were interviewed to learn more about behaviors considered dishonest. Each student was asked to describe five scenarios involv-ing dishonesty in both 100% online and traditional face-to-face (F2F) courses (each type separately). All students were enrolled in both types of courses.

The researchers' codes from the scenarios revealed a major category best described as social versus nonsocial. An example of social dishonesty was receiving help with a test (having an "accomplice"); a nonsocial dishonest behavior was submitting the same paper to two different courses against course policy. Creating a tally of social and nonsocial instances of dishonest behavior and cross-tabulating these with the course the student referenced (online versus F2F) revealed the pattern shown in Table 12.4.

Table 12.4   Hypothetical Cross Tabulation of Type of Dishonesty and Type of Course

Type of Dishonesty	Type of Course	
	F2F	Online
Social	Lower	Higher
Nonsocial	Same	Same

Note: The body of the table reveals the frequency of cheating behaviors.

CRITICAL THINKER ALERT 12.2   QUALITATIVE RELATIONS

Data that qualitative researchers wrestle with (text, pictures, etc.) are not amenable to easy analysis by machine. Yet, just as scatter plots help the quantitative researcher visualize numbers and relationships between variables, qualitative researchers have developed a series of visual aids to help uncover, explore, and explain relationships embedded in the data.

Discussion: Think about relational diagrams and models other than those described in this chapter and describe the value of those displays in exploring qualitative data and portraying the hypothesized relations.

This table reveals a relationship between the two variables being investigated: Online courses are linked to more social dishonesty (seeking answers to online tests from others), but both types of courses are equally linked to nonsocial ("independent") dishonesty (e.g., excessive paraphrasing without citation). Such a finding might give rise to a "social network" theory of academic dishonesty. A logical research question to help develop this

theory would inquire into the rationale for considering help with exams more or less acceptable depending on the type of course.

Only creativity limits how qualitative data may be analyzed and presented graphically. Other common methods of visualizing qualitative information include a concept map (displaying the relations between concepts in two- or three-dimensional space) and an ordered array of linked conditions, as in a wavelength, as suggested by Slone (2009).

INSEPARABLE DATA COLLECTION AND ANALYSIS

Qualitative data analysis and collection occur together, a point emphasized by Merriam (2009). She paints a picture of what could happen otherwise by asking the reader to imagine sitting at a dining room table, data collection done, and data analysis ready to go:

> In one pile to your left are a hundred or so pages of transcripts of interviews. In the middle of the table is a stack of field notes from your on-site observations, and to the right of that is a box of documents you collected, thinking they might be relevant to your study. (p. 170)

Merriam asks, Now what? Where to begin? How do you approach hundreds of pages of data? Overwhelmed? Drowning in data? Did reading the first and second transcripts suggest that you should have asked the third participant a different question, one that opens up a potential theme to explore? Her conclusion from this scenario: "It is doubtful that you will be able to come up with any findings. You have undermined your entire project by waiting until after all the data are collected before beginning the analysis" (p. 170).

The "enlightened" approach would see you focusing on the data from the first participant after collecting that data and writing reflective notes and memos to yourself. A potential category, even theme, might surface early. The second source of data could be used as a comparison; perhaps a tentative category emerges. Data collection the next day will likely be better organized, your thoughts more sharply focused and refined, and your emerging theory in process. The main point that Merriam emphasizes is that data analysis and data collection occur simultaneously; otherwise it not only is "overwhelming" but also jeopardizes the potential for more useful data and valuable findings. Making good sense of data as it comes in (its interpretation) is a process of organization, reduction, consolidation, comparison, and reconfiguration. One has to "break the code," so to speak.

One example of simultaneous data collection and analysis is analytic induction. Presume once again that I am investigating the phenomenon (problem) of dropping out of high school. My goal is to develop a descriptive model that can later be tested for cause-and-effect connections. I locate and conduct an open-ended interview with one recent 11th-grade dropout at her home address (a rich source of data in itself). My interview is detailed and illuminating, and sufficient for me to sketch out an emerging theory to explain dropping out. My next interview provides more information, some discrepant, some not, using my loose model as a source of comparison. I revise my model to fit the second case. My third interview provides rich data (and documents from the student's home) but also requires model modification. With each interview, I revise the model after comparison of the case with the model, adding new components and processes as needed so that all cases fit the model. Eventually, there are no new cases that do not fit my model, even after I purposely search for and interview a case others predicted would not fit. When no reformulation is needed, my model becomes the theory that explains the problem of high school students' not graduating.

The theory contains ample theoretical propositions (hypothesized relationships between variables), clear definitions, and a creative metaphor (perhaps a slow computer that freezes) that captures the essence of my major themes. It is ready for another researcher to investigate its validity.

Merriam's (2009) years of experience in conducting qualitative research yield these time-tested recommendations:

- Use findings from previous observations to guide the next observation
- Track your ongoing learning with written memos
- Test your ideas and themes with participants
- "Play with" visual models (e.g., charts, diagrams, grids, boxes, even doodles!) as well as metaphors, analogies, and so forth

Although Merriam notes that qualitative data collection and analysis can go on "indefinitely," practical and theoretical indications for ending a study exist (Lincoln & Guba, 1985), including the "exhaustion" of sources and "saturation" of categories (limited new knowledge appears to be forthcoming), evidence of "regularities" and a sense of "integration," and "overextended" findings (new data yields information far afield from the research questions or interests).

Let's return to the example of teacher interviews. Try to envision more open-ended or focused interview questions (perhaps 10 in all) across more teachers (20 in all). There will be hundreds of codes, but many are conceptually the same (e.g., "Welcome innovation" and "Experiment with methods"). The first task is to reduce conceptually similar codes into one "grand" code (e.g., innovation). Further reduction is necessary, that being the combination of the related grand codes into a meaningful category with the help of your memos—a category that captures the essence of codes that define it (e.g., flexibility). Saturation is reached once you are convinced the data hold no new surprises, as evidenced by the same recurring code and category patterns in new data. Data collection comes to an end once evidence for saturation exists; there is no need to collect more information.

Eventually, the 25,000 or so words from your interviews are reduced into perhaps five categories (three to eight is reasonable and common). This task can be made far more manageable with qualitative software to manage codes, memos, possible categories, and final categories.

Uncovering the regularities or patterns among categories is a process called thematic analysis (Shank, 2006). The uncovered patterns often create a network of themes. It is in this network showing the meaningful relations among constructs (presumed qualities, traits, abilities, etc.) that the theory emerges. This process is aided by many visual displays (e.g., cognitive maps) that capture synthesized relations among the qualities that exist in the data. In the previous example of interviews with long-term teachers, the following categories could have surfaced: flexibility, resilience, preparation, and innovation. A major theme connecting these categories might be "the adaptive teacher." A theory of teacher adaptation would follow this qualitative analysis and be depicted by a visual model of the hypothesized relations. The model might predict, for example, that flexibility interacts with preparation but not with the other constructs, which are either part of a stable personality (e.g., resilience) or qualities that develop over time in the classroom (e.g., innovation).

EMERGENT METHODOLOGY

Many models of qualitative data analysis have been proposed to help guide researchers. In education and psychology, perhaps the most influential has been **grounded theory** (Glaser, 1998; Glaser & Strauss, 1967). Grounded theory helps the researcher understand the multiple sources of data,

■ **Grounded theory:** An approach to qualitative data analysis using emergent methodologies, such as constant comparison, that permits a theory to develop from the data (from the ground up) without preconceived or inflexible ideas.

■ **Emergent methodology:** An approach to qualitative data analysis that relies on inductive reasoning and a continual interplay between data and developing interpretation.

which are often observations, conversations, and interviews that are combined during the task of note taking. Grounded theory is an example of *emergence* in research. This term suggests an approach that is counter to hypothesis testing, where a preconceived idea about a relationship is tested, or *forced*, by a statistical model (such as the *t* test that assumes a two-group comparison). An **emergent methodology** approach to data analysis seeks to understand the situation and discover a theory implicit in the data itself. Instead of crunching numbers to arrive at a *p* value, a grounded theory researcher uses note taking and coding to find categories or themes (akin to variables for the quantitative researcher), sorts information into meaningful patterns, and writes persuasively and creatively about whatever it is that has been discovered in the data.

The process of constant comparison plays a central role in grounded theory. Here is an example: Suppose that you have conducted interviews with 20 high school teachers related to the topic of classroom challenges. Consider the first interview only. Dick (2005) recommended that you ask yourself these questions: "What is going on here? What is the situation? How is this person managing the situation?" Perhaps the construct of "civility" as a label comes to mind. Next, you code the second interview using the first as a frame of reference. Dick (2005) referred to this as "constant comparison," for you are comparing data set to data set and, eventually, data set to theory.

HIGHLIGHT AND LEARNING CHECK 12.2 EMERGENT METHODOLOGY

Emergent methodology (induction) is used by qualitative data analysts as they gradually build a structure for understanding their findings. They constantly compare a construction of their understanding against data (from the ground up), all the while revising their models as needed without inflexible preconceptions. As each new finding and possible explanation emerges, it is checked against other sources of data until a point of saturation is reached, thus completing the analysis. Explain why qualitative data analysts may not feel "finished" in the same sense that statistical analysts might.

All the while, theoretical ideas should be surfacing ("emerging") in your thinking as an explanation for patterns that might explain references to civility and related categories (or whatever theme is being expressed). Eventually, categories and their properties become *saturated*, as we have noted, meaning further interviews will probably add little to what is known about an emerging category. As properties of the categories become well defined, linkages between them become more sensible. Eventually, a theory or explanation of category relationships surfaces as ideas are compared ("constantly") with actual data.

The literature, or published ideas and findings in related fields, is also treated like data in a constant comparison process. It emerges as well; in fact, the relevant literature is probably unknown at the beginning of the study. Dick (2005) summarized the search for meaning this way: "In short, in using grounded theory methodology you assume that the theory is concealed in your data for you to discover" (Memoing section, para. 4).

RELIABILITY AND VALIDITY: TRUSTWORTHINESS ▬▬▬▬

Can you trust the findings of a qualitative study? Do the concepts offered make sense, given the data collection, analysis, and interpretation? Are the arguments compelling? Are they supported with sound reasoning and ample evidence? Is the whole process, from research question to implications, truly *transparent* and open to critical thinking by the reader?

Many qualitative researcher agree that data *trustworthiness*, whether collected from direct observations, focus groups, or interviews, is evidenced by the following (Lincoln & Guba, 1985):

- Transferability
- Dependability
- Confirmability
- Credibility

Transferability refers to evidence supporting the generalization of findings to other contexts—across different participants, groups, situations, and so forth. This is akin to the notion of external validity used by quantitative researchers. Transferability is enhanced by detailed descriptions (as is typical in qualitative research) that enable judgments about a "fit" with other contexts. Comparisons across cases ("cross-case comparisons") or other units of analysis (classrooms, schools, etc.) that yield similar findings also increase transferability. At the theoretical level, transferability can be achieved by evidence of theoretical transference; that is, the same ideas apply more widely and are shown to be applicable in other fields.

Dependability is akin to the concept of reliability in quantitative research paradigms. In this case, the qualitative researcher gathers evidence to support the claim that similar findings would be obtained if the study were repeated. Naturally, even if the study were repeated in the same context with the same participants, it would become a "new" study, given the ever-changing social world and perceptual shifts (including news events that may change our thinking overnight). Dependability is enhanced by common qualitative strategies (audit trails, rich documentation, triangulation, etc.) but also by traditional methods such as inter-coder or interobserver agreement (two coders or observers are consistent) and code-recode consistency (the same coding or observation occurs more than once using the same "human instrument").

Confirmability refers to objectivity (neutrality) and the control of researcher bias. Bias in qualitative research is an ever-present concern, but unbiased interpretations are more likely once researcher self-reflection recognizes them overtly and factors them into the design by, for example, intentionally seeking potentially contradictory evidence predicted by alternatives (essentially different biases or worldviews). Confirmability is also enhanced by consistency with quantitative research findings that reach similar conclusions. Other evidence includes the consensus reached by peer review.

Credibility

Credibility refers to the believability of the findings and is enhanced by evidence such as confirming evaluation of conclusions by research participants, convergence of multiple sources of evidence, control of unwanted influences, and theoretical fit. Maximum confidence in the believability of conclusions comes from support provided by participants' agreement, analysis of multiple sources of data, others' interpretations, and prediction based on relevant theoretical models (i.e., a predicted pattern matches an actual pattern). As such, credibility is related to construct validity, uncovered by evidence revealing that the construct being studied is the same one theory presumes exists. The concept of credibility is also close to the idea of internal validity as used in quantitative designs (ruling out alternative hypotheses while controlling extraneous influences and artifacts that distort findings).

Many researchers argue that the most important criterion for judging a qualitative study is its credibility. To assess credibility, one would focus on the data quality, its analysis, and resultant conclusions. Any weak link here would threaten the usefulness of the study. According to Miles and Huberman (1994, pp. 11–12), qualitative analysis includes three streams of activity, each deserving sharp focus to evaluate credibility: *data reduction* (simplifying complex data by, for example, extracting recurring themes via coding); *data display* (e.g., matrices, charts, graphs, even stories); and, finally, *drawing conclusions* and verifying them as a means of testing the validity of findings. Qualitative researchers often rely on triangulation to

■ **Credibility:** An overarching criterion for judging the trustworthiness of qualitative data analysis. Credible conclusions are believable when accompanied by strong evidence, clear logic, valid data, and the ruling out of alternative explanations.

enhance the credibility of their study. Recall that this refers to the use of multiple sources of data and collection strategies, all of which should converge.

Essentially, the daunting task for qualitative researchers is to take massive amounts of data, often (not always) in the form of interviews or detailed field notes from extensive observations, and communicate what the data reveal in a credible way. The interpretation of qualitative data depends on the background and creativity of the researcher far more than interpretation of quantitative data does. Also, there are no agreed-on, 10-step procedures that all qualitative data interpreters use. Nevertheless, in some way or other, most interpreters will face the task of organizing the data to enhance the study's credibility. As we have seen, this task nearly always involves *coding*, a modifiable system for categorizing information in the data in a way that permits the data to speak for themselves.

These procedures are directed toward the concepts of reliability and validity that are familiar to quantitative researchers and educational practitioners. Unfortunately, the nomenclature surrounding the concepts of reliability and validity in qualitative research is not consistent (as you might expect among researchers who value personal meaning and interpretation). The little consensus that exists appears to center around the concept of, once again, trustworthiness. Related concepts used by qualitative researchers include dependability, credibility, transferability, confirmability, and authenticity; traditional reliability and validity; and construct, internal, and external validity.

Qualitative researchers agree on strategies that promote trustworthiness in a study. These procedures are described well by Merriam (2009) and include:

- Triangulation, or multiple sources of data as evidence
- Member checks, or arranging for those who provided data to evaluate the conclusions
- Saturation, or continuous data collection to the point where more data add little to regularities that have already surfaced
- Peer review, or consultation with experts
- Audit trail, or the detailed record of data collection and rationale for important decisions
- Thick description, or providing rich detail of the context of the study
- Plausible alternatives, or the rationale for ruling out alternative explanations and accounting for discrepant (negative) cases

Because qualitative research designs are usually flexible, evolving, and may include a "general hunch as to how you might proceed" (Bogdan & Biklen, 2003, p. 40), the audit trail becomes especially important. It provides the information needed for readers to evaluate your conclusions (or repeat the study) and have trust (or not) when acting on the implications. The general advice to "hang loose" (Bogdan & Biklen, 2003, p. 49) means being open and flexible when planning a design, but "rigor" is a more appropriate word when describing qualitative procedures to establish trustworthiness. Because the goal of much qualitative research is a deeper understanding of a phenomenon or process, documentation of the rigor leading to a meaningful conclusion and understanding becomes especially important.

Pattern Matching

The trustworthiness and rigor of qualitative research and its data analysis are boosted by a general procedure called *pattern matching* (Trochim, 2000), a strategy for aligning data to

theoretical propositions. The qualitative researcher might ask, "Here's an idea—is it right? What are contrary, competing explanations? Can I rule them out?"

This procedure "always involves an attempt to link two patterns where one is a theoretical pattern and the other is an observed or operational one" (Trochim, 2000, p. 73). In its simplest form, the theoretical realm is matched with the observational realm, component by component. Trochim recommends visual devices such as diagrams, charts, maps, etc. For example, a concept map (theoretical realm) is matched with a correlation matrix (observational realm), and the distances between constructs on the map should be linked to data analysis findings among the correlations—greater distance, lower correlations. Concepts next to each other should yield the highest correlations, validating theoretical expectations. One major advantage of pattern matching, according to Trochim, is that it requires researchers to specify or "be more careful about" (p. 76) the theoretical and conceptual underpinnings of their empirical work.

Yin (2009) also emphasizes the value of pattern matching, especially when the theoretical propositions and observational data coincide as predicted and do *not* coincide as predicted. One study on creativity, for example, might gather data on five outcome variables (the presumed effects of some cause), such as three measures of creativity and two measures of personality, with the expectation that no linkages will be evident between early childhood experience and later personality in contrast to measures of creativity. The same concept can apply to myriad presumed causes (other than early childhood experiences), some revealing connections (and some revealing no connection) with one or more presumed effects in accordance with theoretical propositions. The same idea may be extended to rival explanations when there are sound arguments for a particular pattern that either supports or refutes the rival explanation. Fine examples of other complex pattern matching strategies are provided by de Vaus (2009, pp. 253–260).

RESEARCH DESIGNS

A qualitative research design is the "logic that links data to be collected (and the conclusions to be drawn) to the initial questions of the study" (Yin, 2009, p. 24). Qualitative researchers have referred to their designs in various ways using difference classification schemes. What follows is a brief description of major qualitative designs, those that have appeared in substantial numbers and contributed in significant ways to the research base in education. All these designs share the general analytic approach to qualitative data described in the preceding section. It is important to recognize in each the approach to qualitative inquiry and not pigeonhole a design as, for example, a multiple-case study or a phenomenological study. This is because researchers themselves may refer to their designs differently.

Case Study

Many description-oriented research questions in education can be answered by intensive study of a single person, single group, or similar unit, such as a classroom or school district. For example, one may wonder (as did Jean Piaget) what the most prominent qualitative changes in children's thinking are as they progress through the school years. Piaget answered this question (in part) by very extensive, extraordinarily detailed study of his own children. As it turned out, Piaget's findings based on his case studies generalized remarkably well to other children as well. Different case studies, however, may not be so widely applicable. Let's suppose that Mrs. Rogers is immensely popular with her math students, and that her students outscore

others by a wide margin on standardized tests of quantitative reasoning. A case study of this phenomenon may reveal charismatic personality factors coupled with very innovative and highly effective cooperative learning strategies. However, Mr. Patel, another very popular and stellar teacher (in terms of student achievement), may have none of Mrs. Rogers's charisma factors or share her teaching strategies. Mr. Patel may display great humor and give highly entertaining lectures. A well-known cinematic case study is *Stand and Deliver*, the 1988 true-story film about Jaime Escalante, the dedicated high school math teacher who inspired his high-potential but at-risk students to excel beyond others' expectations by passing the Advanced Placement calculus exam (a rare accomplishment by any student in the state at that time).

Yin (2009, p. 19), a recognized leader in case study methods, emphasized that case studies may also be useful for explaining presumed causal links between variables (e.g., treatment and intervention outcomes) "too complex" for survey or experimental designs. Further, they may describe the real-life context in a causal chain, illustrate specific constructs, and illuminate a situation when outcomes are not clear. Theoretical ideas are important in **case study design** and are usually developed prior to data collection, since they guide the type of data collected. These can be "stories" that relate events in a process or describe traits and abilities within a structural framework and are instrumental in explaining the complex results. Yin also believes that case studies are "eminently justifiable" in several circumstances, including critical theory testing, unique situations, and typical cases that are especially revealing or require observation and data collection over time (p. 52). Although a case study design may include only a single case (perhaps one person, classroom, or school), designs built around multiple cases (or at least two) are often more informative, given their potential to replicate findings and test (or rule out) rival explanations. Case studies pose challenges partly because the mindful researcher must use creative insight and careful interpretation to make sense of and explain findings (explanation building) that were observed as well as what was *not* observed. (Yin likens the researcher to a historian, who interprets history and builds a logical argument around an explanation, as opposed to a chronicler of history, who describes only the facts.) Further, the evidence may come from sources as diverse as archival records, documents, structured or open interviews, various types of observation (in which the researcher may participate, or not, in some event), and physical artifacts (Yin, 2009, p. 98) in order to provide converging evidence (known as triangulation). Done well, case studies will produce "engagement, excitement, and seduction" (p. 190).

Those who conduct case studies, however, are probably interested not so much in generalizing their findings to others as in telling a story. The story is often full of rich narrative detail and may offer insights about complex processes not possible with, for example, the simplistic rating scales used in a large survey. Good case studies are usually fascinating to read; they are engaging and often speculative. Readers of case studies often find useful ideas within the rich descriptions; they may also be stimulated to look at old problems in new ways. Researchers who use case study designs often find that their research "generalizes" to the extent that others can *use* ideas embedded within the descriptions in some other, often personal, context. In this sense, usefulness may be more important for case studies than wide generalization.

Phenomenology

The oft-cited expression associated with phenomenology is "lived experience," meaning there is interest in how a person's (or group's) experience becomes embedded in consciousness and what meaning that carries. There is a sharp focus on the *essence* of an experience; that is, on

> ■ **Case study design:** An approach to qualitative research that focuses on the study of a single person or entity using an extensive variety of data.

trying to understand the basic structure of that experience and interpreting the meaning it has for a person or group (a socially anxious senior, first-year teachers, gifted learners, etc.).

One example of a phenomenological study is provided by Meister (2010), who has an interest in the phenomenon of change and how it impacts practicing educators. She conducted in-depth interviews with 10 teachers described as "the best" by school administrators in order to answer several questions, including "How were these teachers able to remain engaged and enthusiastic over the course of their teaching tenure?" and "How did these teachers experience professional growth?" (p. 881). (Notice the "How" questions. You will recall that most good qualitative questions begin with "How?" or "What?") As is typical in qualitative research, several themes emerged from her analysis, including " . . . colleagues are their support network; and their commitment to the students transcends academic achievements" (p. 880).

Here is the abstract of another example of a phenomenological study provided by Polidore, Edmonson, and Slate (2010). Note the reference to "life experiences" and the in-depth study of three teachers (a multiple-case study), suggesting this is blend of designs—a phenomeno-logical case study:

> A scarcity of research exists regarding the voices of African American teachers who taught in the rural South. In this study, we report the life experiences, perceptions, thoughts, and feelings of three female African American educators as they pertain to their experiences teaching before, during, and after desegregation. Three female African American educators who taught before, during, and after desegregation in the same school district in the rural South were interviewed extensively. Data analysis revealed themes that mirrored those themes found in resiliency research. By examining these resilience themes within the context of this study, a model of adult resilience in teaching emerged. (p. 568)

Yet another example is provided by Penland (2010):

> The purpose of this study was to examine the lived educational experiences of American Indians who grew up during the 1950s and 1960s, known as the termination period in American history. The research for this phenomenological study consisted of interviews with eight participants who were willing to share their personal experiences from this selected time. Ten reoccurring themes were uncovered: chaos brings balance, challenge to become bi-cultural, the importance of teachers, external support systems, spirituality, tribal influences, influences of economic resources, cultural awareness and value, relevant curriculum, and recruitment of Native teachers. By uncovering these stories, it is hopeful that educators would benefit by being able to further illuminate and contextu-alize an understanding for more culturally responsive pedagogy. (p. 430)

Ethnography

Many variations of phenomenological studies exist in education (e.g., Moustakas, 1994). A close cousin to phenomenology is a qualitative approach commonly called *ethnography*, distinguished by a focus on the *culture* of a society. This usually involves immersion in a culturally distinct group to study everyday life and relies on participant observation as a data collection method. Because qualitative researchers investigate phenomena that do not lend themselves to straightforward measurement, they may not know at first what should be observed, let alone whether the construct could be measured with any degree of meaningfulness. A researcher in this case might use an **ethnographic design**, one of many used in qualitative approaches to educational research.

■ **Ethnographic design:** A non-intervention descriptive research design that is usually participatory and extends over a period of time in a natural setting. It often uses observational methods, interviews, and a variety of other qualitative methods to study the culture of a distinctive group.

Ethnographic research has been associated with the study of anthropology in situations where the researcher observes, or even becomes part of, a group whose culture and social networks are described. Ethnographic researchers may pose a variety of questions. For example, they may ask, "What is it like to teach in a high school that has many students with behavioral problems?" "What is the home environment like for an at-risk preschooler?" "What is an all-girls school like?" "In what ways does typical Catholic education differ from typical public education?" or "Is there such a thing as a typical homeschool, and if so, what is homeschooling really like for elementary school children?"

Ethnographic research designs usually specify procedures and guidelines for taking *field notes.* These notes often form the backbone in the analysis of ethnographic data. The field notes may take many forms, including detailed observations and general interpretations, reflections, and summaries of recorded interviews. Ethnographic designs in educational settings, like most qualitative research, frequently employ the strategy of *triangulation*, a type of qualitative cross-validation (corroboration) or data cross-checking procedure. This is particularly important in ethnographic studies because multiple data sources or data collection procedures are expected to agree (converge) to support a conclusion. For example, a researcher studying the culture of high-achieving homeschoolers might uncover a pattern in interviews, then check to see whether the same pattern holds up in written correspondence, in chosen printed materials, in minutes of a meeting, in personal journals, or during participant observation. The researcher can also check to see whether the same pattern using the same data collection technique is consistent over time. If the multiple sources of data collection are in agreement, the findings are believed to be more credible. Triangulation greatly enhances the validity of qualitative findings.

Published reports of educational ethnographies reflect the rich detail of the blueprints used to carry them out. They are mostly narrative in form, and a better understanding of the phenomenon studied is often conveyed by a good *metaphor* or illuminating story instead of a pie chart or bar graph. Fine examples of ethnographic studies in education can be found in two premier journals (among others): *American Educational Research Journal* and *Qualitative Studies in Education.*

The design of ethnographic research often centers on the extent to which the researcher participates within a group or merely observes a group. The participant versus observer role is not a simple dichotomy. Ethnographic designs may fall anywhere on a participant-observer continuum. An ethnographer studying the lives of teachers in inner city schools may participate in teaching activities or become involved with conflict resolution in the classroom but be a strict observer during faculty meetings. One example of an ethnographic study is provided by de la Piedra (2010), who documented how adolescents' "vernacular literacy practices" (p. 575) enhance the relevance of school learning. De la Piedra's research methodology was classic qualitative and ethnographic, focusing on the sociocultural climate of the school and home by using participant observation and collecting multiple sources of evidence. She says,

> I conducted participant-observations at school approximately once a week. I visited the students' households and conducted interviews and observations that lasted between two and four hours. I conducted informal and formal interviews with teachers, students, parents, and administrators, which were transcribed and analyzed for patterns and emerging themes. I also analyzed students' written artifacts, written school materials, and pictures. An undergraduate assistant helped with data gathering and transcription. In addition, two key informants—teachers from the middle school—provided us with important information and interpretations of events. (p. 577)

Narrative

Research labeled *narrative* is also closely related to phenomenology as well as case study research in the family of qualitative research designs. This type of research is distinguished by the *life story* method, in which people describe their life experiences via storytelling. The task for the researcher is to create a written account (hence narrative) of a person's life from the stories to illuminate the meaning of his or her work or life experiences in ways that help us understand the complexities of, for example, the home environment as it relates to school, the classroom as it relates to the challenges of teaching, or the window-into-the-world chronology of rising from teacher to school superintendent. Far more than a historical record, narrative research captures the *voice* of the participant and offers a collection of themes that help us understand the phenomenon being investigated. The outcome of narrative research is a researcher-generated story (a retelling) that answers "How" and "What" questions about the life story and meaningful experiences that have implications for others. This process is referred to as *restorying*, and the challenge for the researcher is to define the elements of the person's stories (the raw data), identify themes, uncover important sequences, and retell the story in ways that provide insight (the meaning of the story).

Although many narrative studies in education are completed with a single participant (case study), we have already seen that qualitative research borrows principles and design features in clever ways to create hybrid designs. Qualitative research may be especially informative when integrated with quantitative research, as described below.

Mixed Methods

Chapter 3 introduced the idea of *mixed methods designs*, those that integrate or weave together components of qualitative and quantitative designs and analyses. Indeed, mixed methods designs appear in the published literature with increasing frequency, supporting the conclusion that mixed methods is a "paradigm whose time has come" (Johnson & Onwuegbuzie, 2004, p. 14). This is among the most challenging types of research, since the researcher's task is to *merge* both types of data to answer questions that suggest data integration. Mixed methods research implies more than back-to-back separate studies that generate separate data sets, such as Phase 1 (quantitative) followed by Phase 2 (qualitative) without a clear connection. Good qualitative research will answer, with data of different types combined, questions that cannot easily be answered in this back-to-back manner. Here are some examples:

- Does a drug education program reduce risk taking behavior, and if so, *how* does it achieve its impact?
- How do exceptionally creative students approach problems, and are these strategies predictable from early tests of cognitive skills?
- Do themes in students' autobiographies predict going-to-college rates?
- Do students who score high in college algebra excel in critiquing classical music?
- What is happening to achievement scores in low-income schools, and why is this happening?
- Do life stories about overcoming obstacles in youth correlate with job satisfaction measures?
- Does factor analysis of teacher ratings correlate with school climate?
- What do interviews with homeless students tell us that test scores and school records do not?

The advantages of mixed methods research include the potential to offer more comprehensive understanding of a complex process, including the convergence, corroboration, expansion, and elaboration of findings (Greene, Caracelli, & Graham, 1989). The weaknesses of quantitative and qualitative research can be offset by the strengths of both—words can add meaning to numbers and numbers can add precision to words (Johnson & Onwuegbuzie, 2004). One can also argue that approaches to research in education are most valuable when they match the learning sciences (Bryman, 2006), a complex interplay of text, images, and quantities.

All data collection methods and strategies for data analysis apply to mixed methods studies and range from statistical maneuvers in quantitative studies to pattern matching or thematic extraction in qualitative studies. Schulte, Slate, and Onwuegbuzie (2010) provide one illustration of a mixed methods study. Several hundred respondents provided views of the characteristics of effective school principals, which were analyzed using qualitative grounded theory to extract 29 themes (e.g., building relationships). The themes were then statistically analyzed (factor analysis) to reduce them into five related clusters, or "meta-themes." These overriding themes were then analyzed and tested statistically for relationships among demographic variables such as ethnicity. In this case, quantitative analysis followed qualitative analysis. Perhaps quantitative analysis more commonly precedes collection and analysis of qualitative data. For example, test data could be used to identify extreme, interesting, even representative cases for follow-up interviews or observation. The same data set might also yield different types of data. Transcripts of interviews, for example, could also include the delay (in seconds) before answering the question or the time between expressed ideas. Hesitation might suggest anxiety or depth of processing. Audio measures taken from videotaped interviews might suggest other meanings behind the text (e.g., confidence of response).

A formal classification scheme for mixed methods designs has been offered by Creswell and Clark (2007). In the *triangulation design*, there is a direct comparison of both types of data. The issue here is how well the statistical findings complement the qualitative evidence. Do the two match up? In the *embedded design*, there is a need for one type of evidence within (embedded in) a larger study of the other type. Do parenting styles explain extreme outcomes on college admission tests? In the *exploratory design,* the findings from one type of data are required to develop a second study. What themes exist in interview data on teacher despair that permit the construction of a scale to measure despair? In the *explanatory design*, there is a need for one type of data to explain the other type. How do school leadership styles influence the correlation between socioeconomic status and achievement test scores among students?

Given the variation in both quantitative and qualitative designs and approaches to integrating them, it becomes apparent that mixed methods designs are the most complex in the field of educational research. Yet they may be the most useful because they honor true complexity of learning in our schools. Evaluating mixed methods research is also challenging, although guidance is available on how to think about its validity (e.g., Dellinger & Leech, 2007; Leech, Dellinger, Brannagan, & Tanaka, 2010) and why it is useful to separate concerns about *methodological* rigor (procedures) from those about *interpretive* rigor (conclusions) (Teddlie & Tashakkori, 2006). Capitalizing on the *complementary* strengths of both quantitative and qualitative approaches to research (and avoiding the negative overlaps) requires creative strategies that contribute to *legitimation* (Onwuegbuzie & Johnson, 2006), "bilingual nomenclature" reflecting qualitative and quantitative researchers' concern for validity.

QUALITATIVE RESEARCH IN THE LITERATURE

The following section describes qualitative studies that have appeared in the published literature. They illustrate the value of a wide variety of qualitative designs and how researchers think about them.

Classroom Climate

Pierce (1994) investigated the importance of classroom climate for at-risk learners in an interesting study that she described as a "qualitative case study." (You will, however, also recognize elements of an ethnography. Descriptive qualitative research often uses blended research designs; in fact, an "ethnographic case study" is quite common in the research literature.) Pierce's study is clearly not experimental; it is descriptive, as the purpose was to describe in a natural environment how one teacher created a climate that enhanced learning. Her chosen teacher taught middle school (social studies) and had 24 years of experience.

Inspection of Pierce's research design section reveals that participant observation was the method of data collection, and that students were used as *key informants* (those who provided data) to increase the accuracy of the recorded data (which were mostly observations in the form of audiotapes and field notes). Both participant observation and the use of key informants are hallmarks of ethnographic research designs. Pierce also described the use of "triangulation," in her case referring to the convergence of observations and conclusions from the teacher, her students, and herself. Other data were collected from interviews, field notes, and archival records—note the appearance of triangulation once again. The credibility of her data was increased to the extent that all three sources were in agreement.

Pierce stated that "collected data were categorized, analyzed, and interpreted . . . according to the context in which they occurred" (p. 38). The *context* provides an important backdrop for all descriptive studies. One cannot fully understand the case (in a case study) without analyzing how it is embedded within its setting. Ethnographic case study designs are *holistic* in the sense that the person is *total* (unified) and cannot be fragmented into independent parts. Holistic description also suggests that the naturalistic setting must be preserved and interpreted in a richly complex social context.

Pierce reported that "from the initial classroom observations, questions were generated that tended to focus subsequent observations on specific classroom interactions and behaviors" (p. 38). She continued, "Repeating patterns of behavior began to emerge, creating specific categories and subcategories that were used to develop a working hypothesis tentatively explaining how this specific classroom operated" (p. 38). Notice how the design of the study shaped her "working" (tentative) hypothesis. This is radically different from experimental designs used in quantitative research in which hypotheses are often deduced from theory, as explained in Chapter 4. Hypotheses derived from theory are fixed for the duration of the research in quantitative, experimental research.

Hypotheses derived from qualitative observations in descriptive research, by contrast, are flexible. Descriptive (qualitative) research questions can be developed and refined as the study progresses. You will not find any level of statistical significance in a report such as Pierce's. Findings are often presented as an "assertion," as was the case with Pierce's (1994)

HIGHLIGHT AND LEARNING CHECK 12.3 CASE STUDY DESIGNS

Case study designs rely on extensive data collection, usually over time, with a singular focus on one person or entity (e.g., a school). A variety of qualitative methods, including narrative vignettes, may be used to capture rich description and explanation. Which of the following titles is more likely to reflect case study research: "Social Phobia: A Journey Through High School" or "Birth Weight, Social Skills, and Graduation Rates"?

qualitative study: "The classroom ambiance developed through the behaviors and interactions of the teacher and students was one in which the threat of failure was diminished . . . [and] students were provided a 'safe-haven' atmosphere that enhanced learning outcomes" (p. 39).

As you can imagine, "ambiance" is a difficult quality to describe. Pierce used student and teacher quotations to help capture its essence. Her use of the "safety-net" metaphor also helps the reader understand her conclusions. Such metaphors are invaluable communication devices for qualitative researchers. Pierce continued with an assertion that the climate was created with three identifiable components, undoubtedly the result of a careful process of categorization in her analysis. Qualitative data are often categorized in some form or another to aid description and assertion.

Pierce used *vignettes* in her results and discussion. Vignettes are very brief stories, and they are commonly used by qualitative researchers to support an assertion. Careful readers of Pierce's report probably feel they know the teacher of this case study without ever having met her; this familiarity is one mark of a good case study. Any reporting of the teacher's numerical test scores from a battery of measuring instruments would pale by comparison.

The Art of Teaching

Flinders (1989) provides a fine example of qualitative case study research. His study received the Outstanding Dissertation of the Year award bestowed by the Association for Supervision and Curriculum Development in 1987. It also contributed to a conceptualization of "responsive teaching" (Bowers & Flinders, 1990), in which the context of teaching and learning is best viewed as a complex ecology of inseparable language, culture, and thought. His published study begins this way: "Penelope Harper quickly takes roll, steps out from behind her desk, and glances around the classroom. Her eyes meet those of her students" (Flinders, 1989, p. 16). These opening sentences quickly reveal how the reporting of a qualitative study can differ from that of a quantitative one. Instead of describing relevant theory or summarizing reviews of the research literature, Flinders chose to "tell a story." In fact, Flinders (1993) reported that he found his "inspiration" for this research by "going 'back to school.'" Many qualitative researchers use *metaphor* as a mechanism for sharing findings. Flinders chose the "teacher as artisan" metaphor to describe his findings, referring to a "beautiful lesson" or "well-orchestrated class discussion."

Flinders collected a large amount of data, mostly in the form of interviews, extensive field notes from observations (in which he "shadowed" or followed teachers for entire days), and written documents. His findings, in part, took the form of four artistic dimensions. These findings, or focused themes, did not spring from a computer after statistical analysis. Rather, like most qualitative findings, they more likely "emerged" from the researcher's system of categorizing and making connections among all types of data. Flinders could not simply enter interviews, observations, and written documents into a computer, sit back, and watch his findings flash on a screen.

The analysis of such complex forms of qualitative data, such as extracting prominent themes, is a daunting intellectual experience for many beginning researchers. The artistic dimensions of teaching Flinders described were the result of his insight and keen perception more than a "crunching" of numbers. Behavioral observation scales (such as the type found in quantitative studies in which observers rate the frequency of specific behaviors) and stopwatches (used to measure how long teachers wait before answering their own questions) and structured personality inventories (used to measure already established dimensions of personality) would not likely capture the essence of the art of appreciation in the classroom. Flinders, like most qualitative researchers, used memorable prose in his analysis; in this case, he referred to the idea of teachers putting "signatures" on their work as support for his model of teaching as an art or a craft.

Qualitative researchers may not close their reports with a simple summary. They often punctuate their reports in a provocative way, maybe by asking challenging questions or upsetting our traditional thinking about something. The mark of a good qualitative study, in addition to how well it stimulates the reader's thinking, is its persuasiveness.

The Flinders case study (actually a multiple case study of six teachers) deserves high marks for introducing new ways of thinking about teaching as an art. It is an example of educational connoisseurship (first introduced in Chapter 6) because it focuses on interpreting the process work in the context of schooling as art. It is also an example of educational *criticism,* a form of qualitative research that uses observations to seek analysis and interpretation bound together in a manner that is *empowering.* Flinders' design aimed for "structural corroboration," an approach akin to the traditional notion of validity.

The Flinders study also represents a blend of ethnographic and case study designs. The study is clearly descriptive and ethnographic, as its goal was to experience classrooms in an attempt to describe through the eyes of classroom teachers how they view professional life. The researcher's concern that an image would fail to capture the artistry suggests that teachers' views might be described best by a descriptive metaphor, in this case borrowing from fine arts. (Evidently, rating scales could not capture the essence of teachers' perceptions.) Flinders was able to describe teachers' perceptions well because he had conducted extensive interviews; his questions were very effective for the purpose of understanding the art of teaching. Flinders also made careful classroom observations—his field notes—and reviewed classroom documents.

Since Flinders described teaching as an art, which is an insightful description, others can now understand how a lesson could be "beautiful" or a class discussion "well orchestrated." New ideas will undoubtedly emerge from this model of teaching, and thus the descriptive research done by Flinders will have made a valuable contribution, one that would not be possible without a descriptive qualitative research design.

There are many qualitative designs used by educational researchers. Some are simple; others are complex. They may be creative, flexible, informal, and dynamic. All of them, however, serve an important guidance function in that they structure the plan for collecting data and determine how the data will be organized. Generally, qualitative research designs help the process of research by ensuring that the research question (or hypothesis) can, in fact, be answered (or tested) efficiently with a minimum number of rival explanations. As is true with many qualitative research designs, most ethnographic designs have built-in flexibility and allow for adjustments as the research progresses. In fact, qualitative research designs are often

referred to as *working* or *emergent* designs. Qualitative designs are also well suited for blending several different types of research, such as case studies and action research, as the following study illustrates.

Minority Teachers

In conducting research best described as an action research case study, Kauchak and Burbank (2003) observed that a "critical problem facing educators today is the inability of our teacher education system to produce substantial numbers of teachers from racial, ethnic, and language minority groups" (p. 63). Given the context of this problem statement, these researchers sought to answer these two questions: "What knowledge, attitudes, and beliefs influence the student teaching experiences of minority candidates?" and "What influences do school contexts and teacher preparation programs have on the teaching experiences of minority teacher candidates?" These researchers realized the value of rich or "thick" qualitative data and chose to explore these questions using in-depth study of two minority preservice teachers. Kauchak and Burbank conducted intensive interviews with the two candidates and analyzed a "series of assignments designed to identify the interplay between belief systems and how those belief systems manifested themselves in instructional and curricular choices" (p. 64).

The researchers focused on transcripts of interviews, work samples, and professional development portfolios in an attempt to create categories for coding the complex data. Once meaningful categories were created, the researchers could begin to interpret the emerging themes that helped answer their research questions. They discovered that these two candidates held very different beliefs about teaching. For example, one candidate saw the curriculum as "malleable and responsive" and assumed that it must be connected to students' lives. The same candidate viewed classroom management as a method for "establishing relationships with students, making connections to them as individuals" (p. 71). The other candidate had opposing views and perceived the curriculum as fixed and classroom management as a "struggle" and an "obstacle." Kauchak and Burbank identified five possible factors to explain candidates' differences on these important dimensions of teaching (e.g., match with students' culture and different stages of professional development).

Kauchak and Burbank's major findings were that minority teachers bring unique voices and perspectives and sometimes dramatically different background experiences to a teacher education program and are shaped by those factors in complex ways. The answer to their research questions, it turned out, was far from simple. They used their five emerging factors arising from their multiple sources of data to conclude that very different attitudes influence teaching in unique and dramatically different ways. They also learned that differences in school contexts and teacher preparation programs can influence teaching experiences in various ways, depending on the teacher's unique background.

Kauchak and Burbank observed that "like most exploratory research, these case studies raise more questions than they answer" (p. 72). New questions include the following: What attitudes do we want our minority teachers to possess? Do minority teaching candidates interact differently with same-culture students? What placement settings permit the exploration of unique background experiences? These researchers recognized that their study was "clearly exploratory," and because of the limitations of case study methodology, attempts to generalize

beyond these teachers and settings are not warranted. Their study, however, does call attention to an important source of new hypotheses to be tested by future research: the exploratory action research case study.

Learning Disability Coping Strategies

Many of the core principles of qualitative design and analysis are provided by a study of coping strategies among high school students with learning disabilities (Givon & Court, 2010). The researchers noted the "almost insurmountable challenge of achieving academic success" among these learners, creating a "need to listen attentively to the voices of the students themselves, and to learn about their wishes, difficulties, and needs" (Givon & Court, 2010, p. 283). This led Givon and Court to their purpose, which was "to explore the emotional and cognitive processes experienced by high school students with both verbal and non-verbal learning disabilities, and to identify coping strategies they employed" (p. 283). The researchers selected 20 students to provide data, giving this rationale: "The young people were considered to be the experts on their own experience. The sample was a purposive sample, meaning that subjects were chosen on the basis of being able to give information about the topic for a range of disabilities. . ." (p. 283).

The primary data for Givon and Court were "in-depth, semi-structured interviews" with the students themselves but also included other interviews with parents and teachers as well as examination of school records. They note, "These multiple data sources also served for cross-checking of data in the analysis phase. A triangulation process serves to confirm, validate, and extend hypotheses emerging from the data contained in the semi-structured interviews" (p. 283). This study is also marked by data collection over three years (Grades 10 to 12) to describe the students' changing experiences and the development of their perceptions and coping processes.

One example of Givon and Court's "open and flexible" interview questions was, "I am interested in the life stories of students who are being examined for matriculation in the framework of special dispensations. Please tell me your life story from when you remember yourself until today." An example of a focused question was, "What were the first signs of your difficulty?" Over 60 questions were asked, varying over the three years and covering a wide range of understandings, strategies for coping, personal assessments of support systems, and ideas about the future.

Givon and Court used grounded theory for guidance during the data analysis, in which the "resultant model emerges from the data itself in which it was 'grounded'" (p. 286). After transcribing the audiotaped interview, they used qualitative software (ATLAS.ti) "to manage the datasets, and as an aid in coding and compiling flow charts to show connections between codes." Their analytic procedure is described as follows:

> We first identified categories and sub-categories in the semi-structured interview transcripts using an "open-coding" process. These were re-checked, re-assembled, linked to, compared, and cross-checked with each other and with data from the complementary sources. Constant comparison allowed us to identify core categories which were those which appeared frequently, or with greater clarity and focus than others, and which could be related to other categories, confirmed by other data, or categories, or differentiated from them. This axial coding process enabled us to distinguish two central axes around which the other core categories rotated. The

HIGHLIGHT AND LEARNING CHECK 12.4 ETHNOGRAPHIC TRIANGULATION

Ethnographic research designs often use rich qualitative measures over an extended time in a natural setting (a "culture"). They may be "participatory," in the sense that the researcher joins a group (to a greater or lesser extent) to understand its social dynamics and meaning. Triangulation (convergence of measures) enhances the meaningfulness of data, and the findings are often revealed in a story. Which of the following titles is more likely to reflect ethnographic research: "The Social Work of Teaching" or "Correlates of Teaching Satisfaction"? How might sources of data in either study become triangulated?

process of selective coding also enabled us to follow a storyline which enabled a conceptual model to be constructed which differentiated between coping styles, causality, and adaptive and maladaptive behaviors. As Merriam (2001) writes, researchers who build theory in an applied field such as education need to evaluate their emerging theory in terms of how well it fits in the area to which it will be applied and how useful it will be to practitioners in this area. We tried to attend both to the richness and robustness of the grounded theory and how thoroughly it was grounded in the data, and to its clarity and applicability for educators working with students with learning disabilities. (pp. 286–287)

These researchers discovered four coping strategies: avoidance, rebellion, reconciliation, and determination. They presented a conceptual model, including a flow chart, to explain the findings, including two "thematic axes around which the core categories revolved" (the cognitive field and emotional field). Their findings (including quoted excerpts) and explanations of them with reference to the literature are described in depth, typical of qualitative research. They end their report with important implications: "Teachers, school counselors, and remedial educators can use the four coping strategy models to discover students' present coping styles, strengths, and weaknesses, and to then help students improve their strategies for coping" (p. 298).

CRITICAL THINKER ALERT 12.3   ETHNOGRAPHIC CASE STUDIES

Ethnographic and case study research designs may combine, yielding rich, detailed analysis that is not possible with simpler surveys. Ideas that spring from ethnographic and case study research sometimes generate new areas of research or new ways to think about old problems.

Discussion: What research topic would you like to pursue using an ethnographic case study? Can you explain why its rich, detailed analysis might lead to new areas of research?

CRITICAL THINKER ALERT 12.4   CASE STUDY VERSUS SINGLE CASE

Terms for designs in research are confused by the word *case*. The label *case study* refers to a qualitative design that focuses on the extensive study of a single person (or group) using multiple sources of data. By contrast, a single-case design is a type of quasi-experimental design (described in Chapter 10) that evaluates an intervention using a single person (or small group). The terms *single-case designs* and *single-subject designs* are used interchangeably.

Discussion: Researchers using case study designs have different objectives than those using single-case designs. Discuss how each design might be applied to the study of bullying in school.

Dyslexia

McNulty (2003) wondered, "What are the life stories of adults who were diagnosed with dyslexia as children?" (p. 365). His rationale for selecting a qualitative research design is well stated:

> Rather than approaching the study with a specific set of questions or variables, a more open-ended inquiry into the events and emotions related to living with diagnosed dyslexia over the course of life was thought to be a useful way to authentically articulate participants' experiences. (p. 365)

McNulty described his non-intervention research design as the "life story method of narrative analysis," a method of qualitative research that "articulates the experiences" of a group by describing the "qualities within a type of life in a manner that is accurate, relevant, and compelling as determined by those who are familiar with it" (p. 365). The *life story research design*, then, refers to the study of a phenomenon by comparing and contrasting accounts of people who share the same experience.

McNulty began by defining dyslexia by its primary symptoms: difficulty reading and spelling attributed to a problem with the phonological coding of written language. He selected 12 adult research participants (ages 25 to 45) and interviewed them extensively (using audiotapes). Using transcripts, he determined common and contrasting elements of the shared story, created a typology (or classification scheme) that fit all cases, and eventually created a *collective* life story based on participants' own words. Validation of the life story was accomplished by a "self-validation circle" in which the participants reviewed the collective story and judged whether it was an "accurate, relevant, and compelling depiction of the experience" (p. 365). Further, McNulty sought others (none of whom were original participants) who had undergone the shared dyslexia experience to review the collective story's accuracy and generalization. This enabled him to revise the collective life story from the perspective of the wider community similarly affected by the phenomenon of dyslexia. McNulty's analysis was aided by a structural framework that used the elements of a story (prologue, exposition, plot, subplot, resolution, etc.).

The life stories as reported are indeed fascinating. Interpretive analyses of the narrative life stories in context enabled McNulty to characterize dyslexics' attempts to compensate on functional, emotional, and psychological levels. McNulty's creative life story research design effectively uncovered the experiences of dyslexics over the course of life. It revealed what he labeled "LD trauma" and the importance of a "niche" for overcoming problems related to lowered self-esteem.

Parental Involvement

Neuman, Hagedorn, Celano, and Daly (1995) described teenage mothers' beliefs about learning and literacy in an African-American community as revealed in a series of peer group discussions. The researchers identified the beliefs of 19 low-income adolescent mothers, hoping to use this knowledge to enhance the literacy opportunities of the mothers' children. All the mothers lived in impoverished areas and had toddlers enrolled in an early intervention program. The mothers had dropped out of high school and were attempting to complete adult basic education. The researchers noted that parental beliefs have been described using a variety of empirical, self-report instruments that are problematic because they tend to reflect mainstream culture and solicit "It depends" reactions. Neuman and colleagues opted for an open-ended interview format in the

hope of extracting "far richer and more accurate understandings of beliefs" (p. 807). The 10 hours of discussion were videotaped while observers took notes in an adjacent observation room.

The researchers' task of converting data into codable categories was guided by the *constant comparative method* (Glaser & Strauss, 1967), a continuous process of category identification and clarification that results in well-defined categories and clear coding instructions. The research team viewed tapes and read transcripts independently and began to identify themes (categories) by "highlighting particular words or phrases—their tone and intensity—which reflected these themes" (Neuman et al., 1995, p. 809). Examples of categories that emerged from the data included "how children learn" ("being told" versus "experience or interaction") and the mother's role and responsibility in schooling.

The next phase of the analysis was directed toward finding linkages among categories that reflected similar views. Neuman and colleagues found, for example, close ties among all of the following categories: "Learning is telling," "Teachers' role is training," "Teachers' method is drill and practice," and "Learning is demonstrated by recitation." This was a different perspective from that pertaining to categories linked by play, imagination, and meaningful activities. The mothers' views of themselves as teachers were also examined via comparisons and contrasts of categories that fit a common perspective (what the researchers called "typology"). This was followed by an assessment of the credibility of the categories and their representations by members of the research group who had not been involved with data reduction (coding into categories).

The researchers then presented their analytic categories and interpretation to knowledge-able outsiders for examination and revision. The researchers wanted to be certain that their reconstructions accurately reflected the reality of their subjects. Finally, Neuman and colleagues "derived a set of theoretical propositions within and across categories and perspectives that seemed to best encompass parents' beliefs about learning and literacy for their children" (p. 810). They concluded that mothers' beliefs fall on a continuum of perspectives on learning (what they labeled "transmissive," "maturational," and "transactional") and that "through a better understanding of parental beliefs, parental involvement programs may be designed to enable culturally diverse parents to realize their aspirations for their children" (p. 822).

Studies such as that of Neuman and colleagues illustrate the challenge of qualitative data analysis. Good interpreters must tolerate ambiguity as they search for recurring regularities in complex data. Their thinking must be flexible; they must attend to counterevidence as well as evidence as they clarify categories and themes. They must also present their findings in ways that preserve the findings' validity and full meaning and show how a better understanding afforded by the data can be useful for readers.

Detracking

An ethnographic case study by Rubin (2003) illustrates many of the advantages—and challenges—of qualitative data analysis. Rubin's focus was *detracking*, or "the conscious organiza-tion of students into academically and racially heterogeneous classrooms" (p. 540) as a counter-measure to the practice of sorting and grouping students by ability. Her review of the literature revealed an absence of research on the "close consideration of students' experiences with detrack-ing in the nested contexts of school and classroom … embedded in a larger social, political, and economic framework that is marked by race- and class-linked inequalities" (p. 543). Her efforts directed toward the "unpacking" of the detracked classroom were "an attempt to probe the mystery of how daily events and interactions often add up to large patterns of inequality" (p. 543).

After providing a detailed context for the study, Rubin described her methodological orientation as both "interpretive" and "critical," meaning that she retained a perspective that reality is a "social construction" and that our social world is best understood as one "dimension of inequality." Overall, her concern was "eliciting the perspectives of student participation in detracking" and answering the central question "How do students and teachers enact detracking in the classrooms of a racially and socioeconomically diverse urban high school?" (p. 545). She also listed four subquestions "directed at better understanding the experiences of the various participants and the interlocking contexts of detracking at the study site emerging as data collection proceeded" (p. 545). You can readily see that her analysis was not aimed at simply computing a p value and rejecting a null hypothesis.

Rubin's research participants included two teachers and five "focal" students selected as key informants. Her data collection occurred in four phases: first-semester classroom observations, initial interviews, "shadowing" (or following), and end-of-year classroom observations and interviews. These sources yielded a wealth of field notes, but she also collected many written documents ("artifacts"), including e-mails, class handouts, student portfolios, and school newspapers. As with most qualitative studies, Rubin's data analysis was ongoing and "iterative." She began her analysis by composing "analytical memos" on topics that emerged as significant, thus forming the basis of her initial assertions. More-formal data analysis included creating a "coding scheme based on the constant comparison and grouping of data chunks" (p. 549).

Two categories emerged: the "official" world of detracked classrooms (such as expectations established by teachers) and the "unofficial" world (such as students' social and academic desires and the meanings they constructed from official practices). Rubin's findings essentially described the "collision" (clash and tension) between these two worlds in a rich way, often extracting quotations for illustration. Her "unpacking" (unraveling) of detracked classrooms led Rubin to conclude that "the use of progressive pedagogies within detracked classrooms, while well intentioned, cannot alone resolve the inequalities permeating that setting and may in some ways reinforce them" (p. 567).

There has been an explosion of interest in qualitative research and analysis in recent years. As a result, there are many valuable sources available for those wanting to learn more about qualitative research and analysis in education. Sage Publications in Thousand Oaks, California, publishes a wide variety of books, journals, and electronic products focused on qualitative inquiry. Many other publishers include qualitative research references in their offerings, and one of the most widely cited references is Bogdan and Biklen (2003).

The following two brief descriptions of mixed methods studies highlight their advantages.

Immigrant Newcomers

The mixed methods challenge did not deter researchers Suárez-Orozco and colleagues (2010), who provided a good example of mixing methods. They noted the challenges that new immigrant students face in the U.S. school environment, including the early adolescent declining education cycle. Their research focused on the factors that impede or promote newcomer immigrant achievement by using a longitudinal (five-year) mixed methods design. Longitudinal designs (in which the same cohort is studied over time) overcome many of the limitations of cross-sectional designs (in which different participants at different stages are studied at the same time). This permitted a study of the "trajectories" over time: "What factors are associated with distinguishing upward and downward performance over time? How do 'protective' personal, family,

and school characteristics influence academic trajectories?" The quantitative outcome measure (GPA) for the sample of about 400 students was statistically analyzed in ways that defined groups for more intensive qualitative analysis: slow decliners, precipitous decliners, low achievers, improving achievers, and high achievers. Qualitative analysis involved the selection of 75 case studies for semistructured interviews and ethnographic observations to capture a "range of patterns of school engagement and performance" (p. 607). The researchers' qualitative analytic strategy included the use of software to "facilitate the inductive and deductive development and application of codes across data sources, as well as the creation of conceptual models" (p. 607). Further, they noted that "internal validity was established by pattern matching" (p. 607) and described the essence of the mixed method advantage: "The quantitative findings were both reflected in and augmented by the multiple case study analysis" (p. 610) and "A series of case studies triangulate many of the quantitative findings as well as illuminate patterns not detected in the quantitative data" (p. 602). In ways that are not possible with an index such as GPA, their case studies deepened an understanding of and captured complexity in the immigrant experience, including the "remarkable resilience of newcomer immigrant youth" (p. 616).

Scaffolding

Researchers Ge and Land (2003) also provided a fine example of mixed methodology by blending qualitative case studies with a quantitative quasi-experiment. Many educators value complex problem solving tasks, especially those designed to "help students see the meaningfulness and relevance of what they learn and to facilitate transfer by contextualizing knowledge in authentic situations" (Ge & Land, 2003, p. 21). The problem is that many students fail to transfer knowledge across contexts. After a review of published research reports and theoretical ideas, Ge and Land believed that "scaffolding" strategies could help students improve their problem solving performance. (*Scaffolding* is a term coined by the Russian theorist Lev Vygotsky and refers to the guiding help of a more capable peer, particularly in the "zone" where a learner is close to performing a task independently.) Scaffolding was operationally defined by Ge and Land as the use of question prompts (e.g., "What do we know about the problem so far?") and peer interaction (e.g., collaborative learning requiring the sharing of information).

From a solid theoretical background and review of relevant empirical studies, Ge and Land (2003) derived three research hypotheses: (a) "If students receive question prompts, then they will perform better on a problem solving task than those who do not"; (b) "If students work in collaborative peer groups, then they will perform better on a problem solving task than those who do not"; and (c) "If students receive question prompts *and* work in collaborative peer groups, then they will perform better than all comparison groups." Ge and Land were also interested in answering a separate research question: "How does using question prompts and peer interaction influence students' thinking during problem solving?" They chose mixed methodology to test their research hypotheses and answer this research question. They stated that this multimethod approach "helps a researcher to seek a triangulation of the results from different data sources; examine overlapping and different facets of a phenomenon; discover paradoxes, contradictions, and fresh perspectives; and expand the scope and breadth of a study" (p. 25).

Ge and Land used a quantitative quasi-experimental design to test their three hypotheses and a qualitative case study design to answer their research question. The quantitative tests of hypotheses were quasi-experimental since students had already been placed in

intact classrooms (a "natural setting"); they couldn't be assigned on a case-by-case basis to the treatments. Further, the groups of three to four participants could not be determined randomly; they were preexisting, formed previously by the course professors for the purpose of completing class projects. (Had the subjects been assigned randomly to each of the four conditions, the quantitative design would be described as "true experimental," a far better design for uncovering cause-and-effect relationships.) With intact groups, the researchers were nevertheless able to implement their four treatment conditions within a 115-minute laboratory session. The treatment combinations were formed by the researchers' two quasi-independent variables, question prompts (yes versus no) and peer interaction (yes versus no).

The case study design was chosen to supplement findings from the tests of hypotheses and to "gain insights into students' problem-solving processes through think-aloud protocols, interviews, and observations" (Ge & Land, 2003, p. 25). The problem being solved by students in the quasi-experiment was related to customers' having difficulty finding what they need in a large supermarket. Students' problem solving reports were scored by a systematic rubric that awarded points across four dimensions of the solution. These reports were then analyzed as a function of the four treatment groups formed by the two quasi-independent variables (prompts with peer interaction, prompts without peer interaction, no prompts with peer interaction, and no prompts without peer interaction). The three hypotheses were tested by four dependent variables functioning as the operational definition of problem solving performance, each reflecting a facet of problem solving: problem representation, developing solutions, making justifications, and monitoring and evaluating.

A total of 117 undergraduate students provided data for the quasi-experiment; eight students participated in the "comparative, multiple-case studies." Ge and Land reported that case study participants were selected "based on informed consent, level of verbal interaction (with peer conditions), and willingness to be audio taped or videotaped for think aloud protocols, observations, and interviews" (p. 28). (A *protocol* is simply a written record, in this case of subjects' thinking out loud.) The protocols, observations, and interviews formed the basis of the qualitative case studies aimed at answering the research question. The interview questions, as you would expect, were directed at understanding the effects of question prompts and peer interaction (the independent variables, or treatment conditions).

Ge and Land's quantitative data analysis revealed that the use of question prompts resulted in better problem solving performance across all four dependent variables. The peer interaction influences were less striking, with only one of the four measures (problem representation) being significantly higher in the interactive peer collaboration condition (compared to the individual condition). Thus, Ge and Land's data supported the first hypothesis, did not (generally) support their second hypothesis, and did not support their third hypothesis. The qualitative data (think-aloud protocols, observations, and interviews) were analyzed via a process of data reduction, data display, and conclusion drawing and verification. Ge and Land began by "reading and jotting marginal notes on transcripts; identifying patterns and labeling concepts; organizing labeled concepts into data display matrixes; identifying themes; and drawing conclusions" (p. 29). As is customary, their qualitative conclusions were supported by clear examples. Far more complex than quantitative data, the examples revealed information (or insight) that "numbers" data could not.

The answer to Ge and Land's research question, based on qualitative analysis, showed that students' thinking benefits from question prompts by engaging in one or more metacognitive

activities (four were described). Students' thinking benefits from their peer interactions as they build on each other's ideas by eliciting explanations, sharing different perspectives, and taking full advantage of each other's knowledge. It was clear that the qualitative component of this study revealed these positive influences of peer interactions that the quantitative data did not, illustrating why researchers often use several research designs within the same study (mixed methodologies).

The Ge and Land study also illustrates how an inferential study can be combined with a descriptive one. Because Ge and Land's quantitative outcomes were all associated with tests of significance (as revealed by their p values and the consequent acceptance or rejection of their null hypotheses), we know that they intended to generalize to a larger population similar to those who composed the sample and provided data. (Recall from Chapter 5 that each research hypothesis is associated with an underlying null hypothesis suggesting no difference in the larger population.) Ge and Land's research question was directed at learning how thinking is influenced by question prompts and peer interaction and was answered by a descriptive (not inferential) portion of the study. This is because their goal was a description of the sample participants' thinking; there were no associated tests of significance and associated p values. Their answer did, however, reveal ideas for future research that might use inferential statistics.

In addition, their study illustrates how case study research can complement group research. The tests of three research hypotheses (quantitative findings) clearly represented group research; the research question (qualitative findings) was answered with a type of multiple case study analyzed by identifying patterns and labeling concepts. Ge and Land's individual orientation was most apparent in their results and discussion in reference to the ideas expressed by a single case (not a group consensus). Their research was also traditional, with formal tests of hypotheses and an interest beyond a single classroom. (Recall that teacher research focuses on a specific problem facing a classroom teacher with the intent of taking "action" to improve practice.)

HIGHLIGHT AND LEARNING CHECK 12.5 QUALITATIVE DATA ANALYSIS SOFTWARE

Data analysis software is essential for the statistical analysis of quantitative data and is becoming increasingly popular for qualitative data management and analysis. SPSS appears to be a leading program for statistical analysis; it is easy to use (including a spreadsheet format, guided menus, etc.). SPSS is also used for analyzing open-ended survey or interview responses (via Text Analysis for Surveys).

There are many popular programs for qualitative researchers, facilitating retrieval of complex sources of data, permitting a variety of coding, and enhancing category recognition.

Explain how a qualitative software program could facilitate a common task such as constant comparison.

DATA ANALYSIS SOFTWARE

Many software programs exist for the benefit of qualitative researchers. Among the most commonly used are NVivo, ATLAS.ti, Ethnograph, HyperRESEARCH, QDA Miner, MAXQDA, Qualrus, and Xsight as well as several open-source programs such as Transana and Coding Analysis Toolkit. Each has its dedicated fans, but they all facilitate coding, organization, and rapid retrieval of information. (Qualitative software is not essential for basic analysis. I still hear stories about the "old days" when the living room floor was covered with constantly shifting index cards.) Most programs are well designed for self-instruction, are menu driven, and support common sources of qualitative data (text, image, audio, video). They facilitate transcription and support different strategies for annotating, sorting, classifying, and generating custom reports (models, charts, etc.). Of course, software cannot think for you, but these programs ease common tasks in qualitative analysis, such as searching for trends and relationships and building and testing theories.

CRITICAL PERSPECTIVES 12.1   DATA ANALYSIS SOFTWARE

Critical Thinking Toolbox

Concept maps represent knowledge and ideas graphically, often as networks with "nodes" and links (relations). They are especially useful for communicating complexities and enhancing learning by integrating new and old knowledge into more complex cognitive structures. The new structure itself may help thinkers identify assumptions and avoid blind acceptance of messages such as political pitches, commercial advertisements, and so on. Avoidance of blind acceptance is a marker of critical thinking.

Data Analysis Software in Quantitative Research

Statistical analysis of quantitative data is made possible by two main vendors, SPSS and SAS. Data for analysis may be inputted directly into a data window or imported from another source (e.g., a spreadsheet program from a word processor such as Microsoft Word). Both SPSS and SAS have become increasingly user-friendly (especially SPSS), given their pull-down menus, help functions, and tutorials. Both programs contain an extensive array of statistical tests and maneuvers and permit easy management and recoding of data. Graphs, charts, and tables can accompany most statistical procedures, greatly assisting with interpretation and report generation. Some statistical procedures also include annotations on the output. One of the most popular and economical statistical software programs is the student version of SPSS on a single CD, which is easily installed on a desktop or laptop computer.

Data Analysis Software in Qualitative Research

Qualitative computer programs replace more than the hand-analysis tasks of marking, color coding, and literally cutting and pasting information onto index cards. Software programs store data for retrieval in ways that are not practical any other way. Digitized storage permits data organizing and management, coding and searching, ease in developing and connecting themes, exploring data by "memoing" ideas, and presenting and reporting findings.

Making sense of data, of course, is an interpretive task reserved for human cognition. Software cannot replace human creativity, but it surely manages with great efficiency tasks that are likely to lead to an insightful recognition of the data's meaning. Qualitative data analysis programs manage all types of data, including text, audio, image, and video.

Data Analysis Software in Action Research

Teacher action researchers often find that desktop computers have all the software they need to analyze classroom data, present findings, and put what they learn into action. Spreadsheet programs embedded in word processing programs have limited, but often sufficient, statistical and graphic capabilities. Qualitative analysis and many statistical analyses may also be accomplished with the functional capabilities of Word and Excel.

Software in Mixed Methods Research

With the growing influence of mixed methods studies, software designers have developed programs to facilitate the merging of both statistical and qualitative data. NVivo, for example, enables users to import and export quantitative data sets using familiar formats (SPSS, Excel, etc.). This serves the purpose of mixed methods data analysis because text, audio, image, video, and numerical data can be housed in one data structure, sorted, and classified into typologies based on either or both types of data.

Critical Thinking Questions

What might a concept map of data analysis software used in educational research look like? How might it be connected to what you have learned previously? Could it reveal assumptions that might not be acceptable? (Hint: Think about limitations of menu-driven choices, assumptions built into the software, etc.) How might such a map assist your critical thinking about data analysis in general?

SUMMARY

Many rich descriptions of processes and phenomena in education are accomplished best with qualitative approaches to research. Common qualitative designs include case study, phenomenological, ethnographic, narrative, and mixed methods designs. Many qualitatively oriented research questions ("How?" and "Why?") generate hypotheses or raise new questions with the goal of understanding a socially constructed reality. Data collection and analysis are inseparable, and common sources of data include interviews, observations, and documents. Text data are analyzed in a

manner described as creative, iterative, and nonlinear. When cracked open, the meaning that emerges is often conveyed by metaphor. Qualitative inquiry favors field work and natural environments. Data analysis is often accomplished by coding, category formation, and theme extraction using techniques such as pattern matching (linking observations and theory). Analysis continues until saturation (diminishing returns). The goal is insight, and discoveries are often presented with visual heuristics such as hierarchies, typologies, networks, and cross tabulations. Qualitative research-ers frequently employ triangulation, a type of cross-validation (corroboration) or data cross-checking procedure in which multiple data sources or data collection procedures are expected to agree (converge). The process is akin to a rigorous art, with the researcher functioning as the instrument and analyzer, and the result is often powerful narrative in story form. One influential model of making sense of qualitative data is grounded theory, which emphasizes the emergence of meaning concealed in data. Credibility or trustworthiness, established with compelling evidence, is enhanced by emergent methodology, or the continual interplay between data and developing interpretation known as constant comparison. Qualitative data analysis is facilitated by software programs that are valuable for functions such as coding, retrieval, sorting, and other types of pattern seeking. Mixed methods research integrates qualitative and quantitative data, the advantages of both offsetting the weaknesses of both, and attempts to arrive at a more complete answer to a research question.

KEY TERMS

Case study design 366	Ethnographic design 367	Triangulation 350
Credibility 363	Grounded theory 361	
Emergent methodology 362	Saturation 350	

APPLICATION EXERCISES

1. Consider each of the following research scenarios. Determine which of the following qualitative research designs is most appro-priate: case study, phenomenological, ethnographic, narrative, or mixed methods.

   a. Studying how Ms. Overton consistently closes the gender gap in her AP chemistry classes.

   b. Studying how high school mentoring affects students' aspirations and career decisions.

   c. Studying how many hours per night sixth graders report working on homework assignments and how they feel about it.

   d. Studying how tribal educators differentiate instruction to meet varying learning styles.

   e. Studying how students with severe social anxiety cope with social demands in high school.

   f. Studying what it is like to teach at a private progressive school.

   g. Studying how a teacher recounts her life in the classroom for 70 years.

   h. Studying the extraordinary accomplishments of ten 75-year-old full-time teachers to learn why they believe "the mind is a muscle."

   i. Studying master teachers in their classrooms to learn about their view that teaching is a type of "heartfelt artistic expression."

   j. Studying students who struggled with math anxiety during their schooling by asking them to recount their experiences and tell their story with insight into their challenges.

   k. Studying how an at-risk school outperforms all others in the urban district.

   l. Studying all-girls schools to learn how they shape career aspirations and socialization.

2. Locate a recent published report of qualitative research in education in a premier journal such as the *American Educational Research Journal.* Focus on the data analysis section and summarize how the researchers established the credibility of their findings.

3. Ask five students enrolled in another education course to write a brief essay titled "How Students Learn." Carefully analyze the essays for a common theme. Is there one? How might you describe this theme? Can you justify this theme? Do you think someone else would extract a similar theme after studying the essays?

STUDENT STUDY SITE

Log on to the Web-based student study site at www.sagepub.com/suter2e for additional study tools including:

- eFlashcards
- Web Quizzes
- Web Resources
- Learning Objectives
- Links to SAGE Journal Articles
- Web Exercises

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